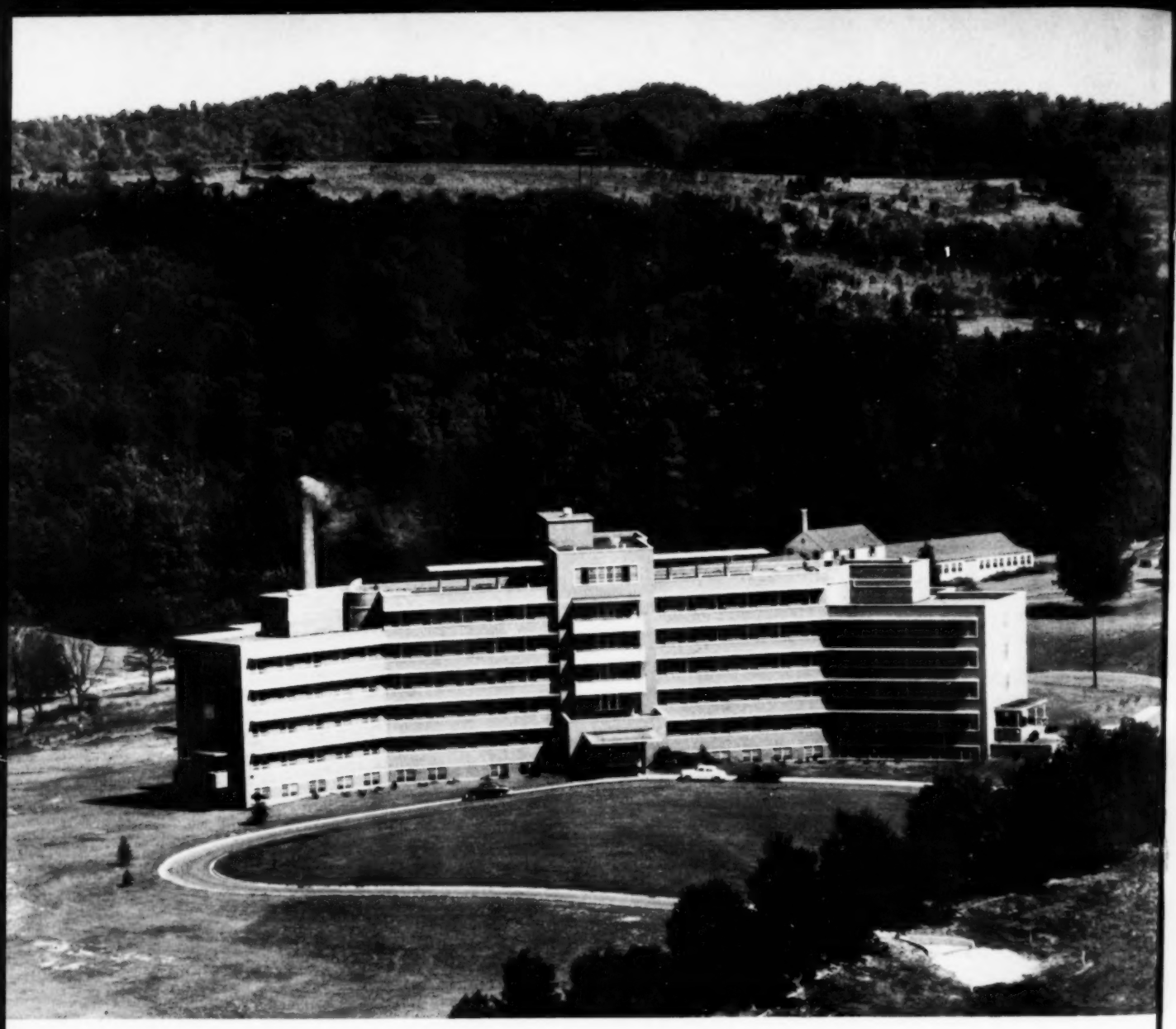
PUBLIC HEALTH REPORTS

In this issue

FEDERAL SECURITY AGENCY • Public Health Service



Tuberculosis Hospital, Knoxville, Tenn.

The Tennessee State Department of Health has nearly completed a system of four hospitals to meet the urgent demand for additional facilities for the treatment of patients with tuberculosis. All of the hospitals were built by the State with the aid of the Hospital Survey and Construction Act. Although they were designed for the treatment of tuberculosis, each includes the major services of a general hospital. The 180-bed East Tennessee Tuberculosis Hospital at Knoxville, designed by Bauman and Bauman, was the first of the four hospitals to be completed. Two others have also been finished and the fourth is under construction.

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PUBLIC HEALTH REPORTS

FEDERAL SECURITY AGENCY
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FOOD

in Civil Defense

Selected papers from the United Kingdom, United States, and Canadian Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense, London, November 26 through December 13, 1951.

Upon the invitation of the Government of the United Kingdom of Great Britain and Northern Ireland, the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense was convened in London on November 26, 1951.

Official delegates from the Government of Canada, of the United Kingdom, and of the United States of America participated in sessions which extended through December 13, 1951. The Canadian delegation was led by Maj. Gen. F. F. Worthington, Civil Defense Coordinator of Canada, Ottawa; that of the British by G. S. Bishop, Under Secretary in Charge of Defense Plans, Ministry of Food, London, England; and that of the United States by Paul B. Murphy, food specialist of the Health and Welfare Office, Federal Civil Defense Administration, Washington, D. C.

The conference considered, in the light of the experience of the United Kingdom in World War II and of the subsequent development of plans in all three countries, the administrative and scientific problems which arise in maintaining food supplies as part of defense measures.

After a broad survey of the problems in plenary session and a general review of experience, the conference organized detailed discussions in three major groups. One considered emergency feeding problems. The second section examined problems of food administration, and the third probed present status and future needs from a scientific standpoint.

Public Health Reports presents in the following pages and in succeeding issues a number of the more significant papers which have now been made available by the three governments.

In selecting the papers for *Public Health Reports* emphasis has been placed on topics of broad interest and practical importance to public health—nutritional considerations, food sanitation in emergencies, research. By way of introduction, a summary of the conference findings and recommendation to the three governments precedes the first group of papers.

The London Food Conference

—A Summary of Findings—

Civil defense organizations must be prepared to feed entire populations for days and perhaps weeks in the event of atomic attacks on major cities.

To be ready for any atomic emergency, mass feeding plans must be perfected, which will utilize the full resources of industry and all voluntary agencies.

Although individuals are responsible for their own survival, the feeding of stricken populations would present such immense supply, transportation, and distribution problems that large areas and even entire nations would have to assist.

Such were some of the general conclusions of the conference. Following are high lights in the three main areas of discussion—emergency feeding, administration, and scientific problems. The wording of the report from the conference to the three governments is closely followed or is paraphrased.

Emergency Feeding

Emergency feeding is designed to feed in wartime all members of the civilian population who are unable to obtain meals through normal channels. It is strictly an emergency program and must not last any longer than needed. The earliest possible return to normal is vital.

Plans for emergency feeding must not be confined to those areas which have been designated as target areas. The urgent needs of the homeless and the injured who move or are moved into other areas and the obligation of all areas to provide mutual aid require that every community develop complete feeding plans.

The steady development of new and more powerful weapons makes it essential that the very sound plans developed in Great Britain for emergency feeding during World War II be broadened. The vastly greater number of persons who may be without food or the normal means to prepare and serve it, as the result of atomic attack, demands that fuller consideration be given generally to the responsibility of the individual for his own survival, and of the community and the nation for the essential feeding of its citizens.

On the other hand, the essence of preparation must be the anticipation of the unexpected. Too great a preoccupation with atomic attack may lead to neglect of this fact. On both sides of the ocean there must be preparation to feed people under any condition.

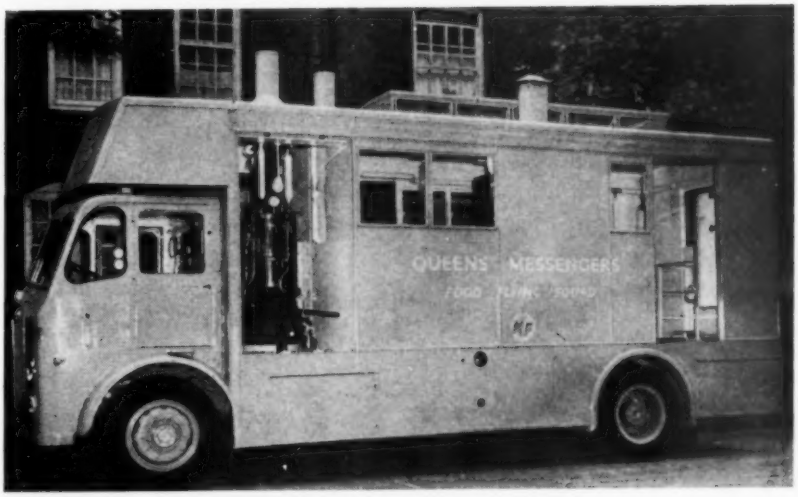
Leadership and Decentralization

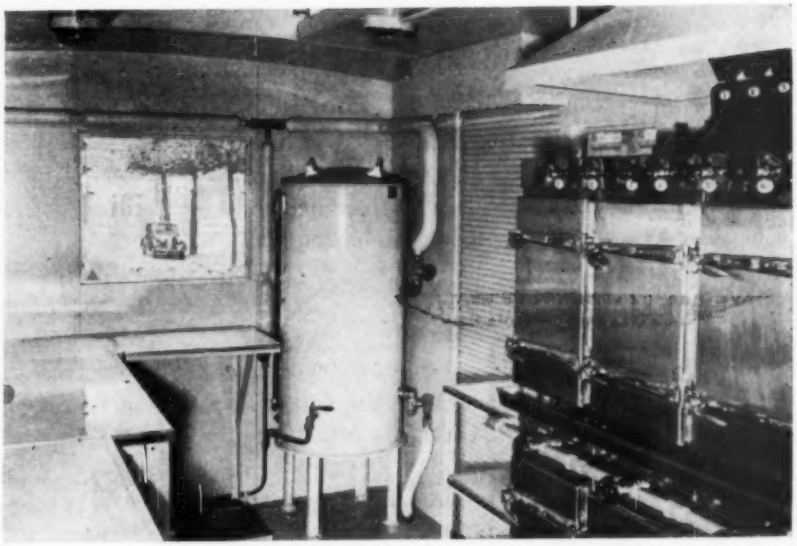
All three nations have recognized the importance of local governmental responsibility.

Queen's Messenger Convoys

Queen's Messenger convoys were inaugurated personally by Her Majesty during the worst raids of the last war in 1941. Their function is to bring immediate relief after serious air attack. They provide light, hot meals. The Ministry of Food, under whose direction the convoys were administered, found that a convoy's early arrival after an attack helps to keep up morale by showing that relief is on the way, and that something is being done.

The convoy is designed to provide between 6,000 and 8,000 light meals of soup or tea and sandwiches at one operation. Each canteen also carries infant foods in feeding bottles. A self-contained unit, the convoy carries sufficient food to operate at capacity for 2 days, and sufficient hard fuel for 6 hours' continuous operation. Extra fuel is obtained at the site.





Top: **These eight vehicles represent one-half of a Queen's Messenger food convoy. A full convoy consists of an office van, two equipment stores vans, eight canteen vans, two 500-gallon water tankers, two food stores vans, and a welfare van, plus three motorcycles.**

Center: **The Queen's Messenger kitchen van is used as a separate unit and not as part of the convoy. It is capable of turning out 500 main meals (meat, vegetables, and a sweet) per cooking or 3,000 meals per 24 hours. This picture shows the over-all unit and the Merryweather boiler directly behind the cab.**

Bottom: **The rear interior of the kitchen van is shown here. The 50-gallon hot-water boiler, hot plate, sterilizer, and part of the steaming oven unit can be seen.**

All photographs courtesy of the British Ministry of Food.

The conference emphasized the importance of further delegation of responsibility to the heads of the various local government departments. Civil defense, they underscored, is a civilian responsibility. Food plans must not include operational dependence upon the armed forces.

Strong, imaginative, disciplined, and trusted leadership from the city block to the nation is imperative. Great disruption demands great local responsibility. The community that is not able to feed its people threatens its own existence and endangers the nation.

Recruitment and Training

Training must be training for survival—training in improvisation. It is of first importance to train people to prepare and serve meals under extraordinary conditions. Every community has cooks ranging from the housewife to the commercial chef, but few people know how to improvise or how to operate when the usual hygienic safeguards are lacking. Training must be simple, clear, and practical. The basic staff of instructors need not know the theories of modern warfare. They must know how to do what they must do, and this they can learn only by building or using improvised equipment.

Improvisation

The first essential in emergency feeding plans is the ability to provide food under primitive conditions. It must be assumed that utilities will be destroyed throughout the community and that food must be prepared quickly on whatever equipment is available in the rubble. Safe water is of paramount importance. An ample supply of transportable cooking units to supplement improvised elements must be provided. Plans must be made to use alternative fuels in fixed cooking installations which now depend on gas or electricity.

Commercial Facilities

No present plans for emergency feeding can be complete unless they include the full utilization of the commercial caterers, restaurateurs, and all others who sell meals. It is imperative that every commercial restaurant be opened for business as quickly as possible after an attack.

Plans for the future must contemplate that great numbers of people must be fed, and that publicly owned facilities, such as school lunchrooms, may be inadequate. These basic feeding centers, both public and commercial, must be supplemented by additional feeding centers, mobile canteens, food convoys, and improvised cooking facilities.

Voluntary Agencies

While the basic responsibility for emergency feeding, as with all civil defense, rests with government, the personnel and skills available in voluntary agencies must be brought into full employment. Although civil defense authorities cannot divest themselves of responsibility by the delegation of authority to voluntary agencies, it is felt that broader use of these groups can be made.

Supply and Stockpiling

Food must be available where it is needed or there can be no emergency feeding. Supply organization must be decentralized in such a way that each emergency feeding officer at a feeding center knows how and from whom he will get his food—and will actually get it.

Food stockpiling in each country is influenced greatly by the supply situation. The British, for example, rely primarily on ordinary channels of trade for distribution, but reserves of powdered soup and canned meat in gravy are being held. Plans have been made to insure that necessary supplies of foodstuffs be made available to emergency feeding centers and rest centers to meet the first impact of need.

Availability of pots, pans, dishes, cups, and cutlery pose difficult problems. Great quantities of water will be needed for cleansing and sterilizing. Disposable articles will be of great value if they can be available when and where needed.

Water is a vital necessity. The supply in many communities can be destroyed or readily contaminated, and requires much time for restoration. This is a major supply and reserve problem.

Food Items and Menus

What foods to use in an emergency, the conference noted, is perhaps the least important consideration because we can only serve foods

which are available at the time. However, two principles governing the "menu" emerged from the discussions.

First, a hot, sweet drink must be available for great numbers of people as quickly as possible after the attack. This is a "must" for it helps to relieve shock and restore morale and public order. Preparations for this cannot be casual.

Second, a good, hot meal—not a snack—should be provided within a few hours. British experience shows that this meal often marks the point at which an individual can and will pull himself together and set about the business of solving his own problems.

Improvisation does not mean that menus do not need to be prepared and placed in the hands of the people who must prepare meals. Improvisation is resourceful deviation from a plan, not frantic activity. The full resources of people trained in nutrition and home economics should be called into service in planning meals as well as supervising feeding operations and training workers.

This is the interior (looking forward) of one of the eight canteen vans in a Queen's Messenger "food flying squad" convoy. The canteen is mounted on a 2-ton chassis. The panel section (left) lifts to form a shelter over the counter. The insulated containers seen in racks on either side are used to carry tea, soups, stews, and sandwiches.

Two 500-gallon mobile water tankers are part of each Queen's Messenger convoy. The internally galvanized tank is mounted on a 3-ton chassis. It is provided with a pump capable of delivering 1,000 gallons per hour.

Food for Special Groups

Problems relating to the feeding of a number of special groups remain largely unresolved. Civil defense workers will require regular and substantial meals; the injured in hospitals will require special feeding as will infants and expectant mothers. Further study must be given to these problems in close coordination with the other civil defense services concerned, especially by those responsible for medical and public health services.

Food Administration

The primary object of good planning in civil defense is the preservation of civilian fitness, morale, and the will to win. It is necessary to meet the physiological need for sufficient food to sustain the national effort, but this is not enough. The people must have faith in the rapid restoration of normal facilities and have confidence that their accustomed foods will be in the shops with fair shares for all.

Food supplies must be maintained under all conditions. It is important to restore in the shortest possible time the regular production, processing, and commercial distribution of all the basic foods. It must always be possible to

meet the needs of those able to provide for themselves, of catering establishments, and of the emergency feeding services.

In general, the administration and supply group felt, the key to the successful operation of wartime food planning lies in the wholehearted cooperation and self-organization of the individual food industries and trades working with the government units concerned.

Planning and Leadership

Planning in advance is essential and must be integrated so that the local and regional plans fit into the national plan. There must be coordination at each action level.

It is impossible to make detailed arrangements for every eventuality. The plan must be so prepared that the responsible leader on the spot is free to improvise and make adjustments to meet special circumstances. Only by decentralization can an effective answer be found in time.

Good leadership is of the utmost importance. The leader must have the human touch and evident sincerity, the moral courage to make immediate decisions, and that quality which succeeds in getting others to do what is wanted as part of a common objective.

Self-Help and Mutual Aid

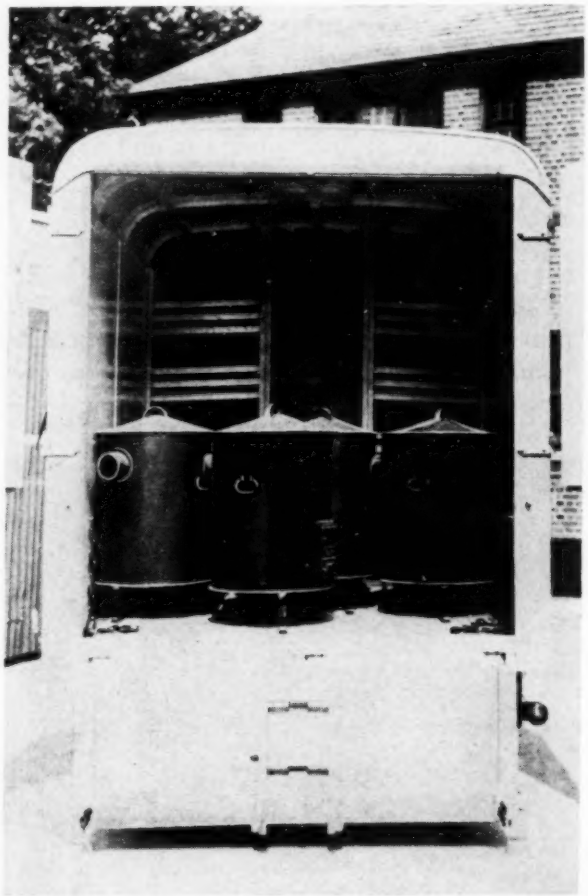
Self-help is important because it is good for the individual's morale and reduces the burden on the civil defense services. It should range from the household to the nation.

The conference report noted that in the United Kingdom the application of this principle to the food industries and trades produced successful mutual assistance during the last war. Whenever a trader suffered from enemy action his normal competitors came to his aid. This might entail the provision of warehousing or counterspace, delivery services, and even processing of food. In many instances, the traders who assisted in this way refused to accept any portion of the profits from the additional business. Many of the agreements were oral, but were always fulfilled.

Dispersal and Transportation

Dispersal is an important safeguard against mass destruction of food and against the interruption of supplies through serious dislocation of transport.

Under wartime conditions, transport and communications become of first importance. The aim is to see that the food is delivered with a minimum demand upon the transport system.



This rear view of a stores van in a Queen's Messenger convoy shows the 2-ton truck loaded with Soyer Boilers, part of its regular equipment. The vans are based near the scene of an attack and the boilers are used to heat tea, soups, and stews which are then loaded into insulated containers and transported by canteen vans to sites where emergency feeding is necessary.

Bread and Milk

Immediately following a heavy attack, the most urgent food supply problems concern bread and milk—the two basic foods for adults and children which cannot easily be stored. Regular deliveries of these two foods are im-

portant in sustaining morale. The demand for bread under these circumstances, the British reported, has been found to increase at least twofold.

Salvage and Glass Damage

The prompt application of proper salvage methods can reduce considerably the loss of foodstuffs from enemy action or ordinary fires. It has been estimated that about 75 percent of the food lost in the first attacks on Britain could have been avoided if measures later developed for the recovery of damaged foods had been applied.

Special attention should be given to the problem of destruction of food by glass splinters. This was a cause of serious loss in Britain. Even packaged and canned foods were frequently perforated by glass particles.

Scientific Aspects

For the maintenance of health, consumer satisfaction, and a high level of work output, the provision of adequate calories is the primary requirement, the scientific delegates agreed. This assumes that adequate amounts of the essential nutrients are contained in the available foods and that the foods are so distributed as to protect nutritionally vulnerable groups.

On the other hand, the conference held, the primary consideration in short-term emergency feeding is the provision of acceptable foods sufficient to allay hunger and sustain morale. Detailed consideration of nutrient values is unnecessary since specific nutritional deficiencies will not develop during this short period in previously well-nourished individuals.

Special Population Groups

Infants are unusually susceptible to even a temporary interruption of their food supply and should receive special consideration in planning supplies for emergency feeding. However, it is not anticipated that with a previously well-nourished population any specific nutritional deficiencies would become evident within a month. It should not, therefore, be necessary to take any special measures to distribute vitamin concentrates to mothers or infants during this period.

Emergency workers and those engaged in heavy work must be well fed, of course, but there is no adequate basis for the classification of workers or industries into arbitrary groups, such as heavy, medium, and light, and therefore for the assessment of their energy requirements. More up-to-date information is needed.

Measuring Nutritional Status

The conferees agreed that experience has demonstrated the necessity for determining the nutritional status of populations under wartime conditions as a guide in the distribution of limited food supplies. Simple methods are essential for this purpose.

Accurate measurements of weight and height should form a major criterion in such an assessment. Combined with clinical appraisements of health, such measurements would have a notable value in assessing the effects of changes in food practices. At the present time base-line reference data of weights and heights, to which changes could be related, are either nonexistent or inadequate.

Steps should be taken now to collect the necessary base-line data and any other appropriate anthropometric measurements in such fashion as to permit comparisons between countries. Research also should be encouraged on additional tests which might supplement the anthropometric data, such as measurements of hemoglobin, enzymes, and specific nutrients.

Emergency Food Hygiene

In discussing sanitation problems in emergencies, the conference pointed out the need to allay public anxiety about the hazards of atomic warfare to food production and supplies, and to place such hazards in proper perspective.

The conferees considered that induced radiation does not constitute an appreciable practical hazard to food. "Fall out" contamination of food from a high atomic burst is usually slight.

Undestroyed food in unbroken containers may be consumed with safety if the container is cleaned externally. This same principle can be applied to food in bulk storage if the superficial layers are removed.

A ground or underwater burst, on the other hand, may result in heavy contamination of a

considerable area. In temporarily uninhabitable areas food will not pose an immediate problem. Monitoring should be used as a guide in entering these areas and assessing the safety of the food found there.

Biological Warfare Hazards

Biological warfare may involve a twofold risk to a country's food supplies: a reduction in agricultural output due to infection of crops or livestock, and contamination of food that will involve a direct hazard to human health.

The conference reported that the hazards to food from biological warfare and bacterial contamination could best be reduced by (*a*) the full development of public health and similar services and the utilization of existing knowledge in detection and control; (*b*) the inclusion of instruction in the hygienic handling of food as part of civil defense training; and (*c*) the universal application of heat to all suspected foods.

Chemical Warfare Risks

Chemical warfare hazards through contamination apply both to agriculture and to man, the conference noted. The risk to the former is probably small, and the risk to man is considered to be most likely in terms of antipersonnel weapons. Where hazards to foods are involved, methods of identification, protection, and decontamination are the main defensive measures.

Concentration of Food

Although the dehydration industries have been severely curtailed since the last war, the conference reported renewed interest in dehydrated products for use by the armed services and civil defense. There is need for further research—including far more background research—into means of improving palatability, ease of reconstitution, keeping quality, and packaging.

Scientific Problems in Food Defense

By NORMAN C. WRIGHT, D.Sc., Ph.D.

It will be convenient to group the scientific problems of food defense under three broad heads: first, those concerned with the maintenance of an adequate and acceptable diet for all sections of the population, and specifically with meeting essential nutritional needs under emergency conditions; second, those involved in the reduction of the bulk and weight of essential foods, in their storage properties, and in their distribution in a convenient, attractive, and easily handled form; and third, those related to the protection of food stocks and to the salvage of damaged supplies.

Many of the problems falling under these three heads are closely paralleled by the wider problems of maintaining an adequate national food supply under war conditions. Moreover, they are relevant even in the more limited field of emergency feeding of the fighting services where specially concentrated ration packs are used. This is, indeed, the reason why the civil departments concerned with research and development in food science in the United Kingdom share with the services the responsibility for investigating the scientific problems involved in food defense—a partnership which has in practice proved of great mutual benefit.

Dr. Wright is the chief scientific adviser to the Ministry of Food of the United Kingdom. He presented this paper in London, November 30, 1951, at the plenary session of the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense.

Maintenance of Adequate Diet

Basically, the adequacy of a diet is measured in terms of specific nutrients, that is, its calorie value and its content of protein, mineral constituents, and vitamins. In considering the long-term needs of a whole population under war conditions, all these must be taken into account. But for relatively short-term purposes, such as those involved in temporary emergency feeding, evidence indicates that it is the total calorie value of the diet which is of primary importance and which can be used as the best index of nutritional adequacy. This applies particularly to civil defense and essential industrial workers who have to undertake heavy physical tasks, frequently under conditions of stress. From the planning aspect, it is therefore essential that we possess a clear view of the levels of calorie requirements of different sections of the population under such conditions. We also need an indication of the probable effects of reduced calorie levels on physical efficiency, industrial output, and morale, particularly when the interruption of normal feeding is likely to be prolonged as in hastily evacuated industries or in areas cut off from normal supplies by enemy action.

Apart from the consideration of total food intake as measured in terms of calories, provision must also be made for safeguarding the health of the so-called vulnerable groups in emergency conditions—expectant and nursing mothers, infants, and invalids. The nutritional needs of these groups are well recognized. The technical problems involved are concerned rather with the provision of substitutes for essential foods, such as liquid milk, should normal distribution fail, and with devising packed rations for these special groups during evacuation or temporary isolation. A further group whose requirements under emergency conditions need to be assessed and met are those injured as a result of enemy attack, whether from shock, physical injury, or damage from special hazards such as radiation. These aspects of special dietary requirements under emergency conditions clearly form the indispensable basis of any emergency feeding plans.

But while a sufficient supply of essential nutrients is the prerequisite of an adequate diet, it is no less important that such nutrients should be furnished in an acceptable form. It cannot be too strongly emphasized that one of the most effective means of maintaining the morale of a population under stress is that their diet, and the foods which compose it, should deviate as little as possible from normal food habits. Thus, in the United Kingdom great stress was laid in the last war on the maintenance of daily deliveries of bread and of milk. In the same way such foods as are provided at emergency feeding centers should be those to which the people are accustomed and attracted; a sudden emergency is no time for introducing untried novelties. A typical example which may be quoted to illustrate this point is the provision of dried soups for emergency feeding. It is right and natural that nutritional experts should stress the importance of insuring that such soups have a high nutritive value, but it is at least equally essential that this should be combined with universal acceptability. Indeed, for short-term emergency purposes the first essential is that the foods supplied should be attractive to the consumer. The problem of the food scientists is how to incorporate into such an attractive dish the nutritive properties which furnish maximum sustenance.

Reducing Bulk and Weight

This principle is equally important in considering the second group of problems listed earlier: those involved in reducing the bulk and weight of essential foods and in improving their storage properties. For many foods, notably animal products—such as milk, eggs, and fish—vegetables and fruit, the most effective method of reducing bulk and weight is by eliminating the contained water. But it is found that the most acceptable of the resulting artificially dried products are those which on reconstitution most closely simulate the natural food.

Thus, milk powder manufactured by the spray drying process furnishes on reconstitution a product practically indistinguishable from liquid milk and has a ready sale. The present difficulties in reconstituting it into liquid form, however, still make it less acceptable to many housewives than, for instance,

canned evaporated milk. Dried egg powder, the uses of which as a substitute for shell eggs are more limited, only achieved popularity as a result of the serious shell egg shortage and after the housewife had gained considerable experience in its use. In spite of its ease of reconstitution, potato mash powder still has only a limited sale. Moreover, the trend of demand in the British fighting services is for dried potato slices rather than for mash—an indication of the general preference for a product which on reconstitution most closely retains its original appearance and properties. There is little doubt that the same general argument would apply to other dried vegetables (as it does to dried fruits) and to dried meat and fish if offered for sale to the public.

Three Essentials

These examples have been quoted to show that, in devising methods of reducing bulk and weight, at least three essentials must be taken into account: first, the product must be capable of reconstitution into a form to which the consumer is accustomed; second, the method of reconstitution into this form must be simple and rapid; and third, the product must be capable of storage for relatively long periods without deterioration in flavor or texture. If these conditions could be met, such dried products could, from the standpoint of civil defense, be of real value. In the first place they would form an attractive variant in emergency meals or in the supplies used for the initial feeding of evacuated populations—or indeed for temporarily isolated populations who can only be fed by airlift operations. In the second place, if the housewife were once accustomed to their use in the home, they would form a valuable item in household larder stocks to meet temporary or emergency shortages. For both these purposes it is, however, essential that the products be sufficiently attractive to find a market under peacetime conditions so that in an emergency they would not be considered simply as undesirable substitutes for the genuine product. They must, in brief, possess sufficient advantages to stand on their own merits.

The production of artificially dried foods of improved acceptability constitutes one desirable technical development in this field. There are, however, a number of other directions in which science should be able to increase the availability of foods for emergency purposes. Bread constitutes the main basis of all Western diets, but at present we are completely dependent on static or, in an emergency, mobile bakeries for our day-to-day supplies. While the bulk of a nation's bread will always need to be freshly baked, it might well be desirable to have available an alternative long-keeping product for which local baking facilities and fuel supplies are not needed. Canned bread and foil-wrapped bread provide two methods of meeting this need. Another alternative is the more extended use of antistaling and antimold agents. While the use of such agents is probably not desirable as a national policy in peacetime, it ought clearly to be given consideration as a possible emergency measure. The same comment applies to antioxidants, which are capable of delaying the development of oxidative rancidity and tallowness in the long-term storage of fat-containing foods.

Fields for Study

Any assessment of the effectiveness of such special measures, and of the possible risks which they might entail to the consumer, must be based on scientific investigations of a relatively fundamental nature. Systematic studies are, however, equally necessary in solving many of the more practical problems involved in emergency feeding. Thus, the selection of equipment for the preparation and serving of meals at emergency feeding centers necessitates careful tests of their suitability and reliability. This applies not only to such considerations as the effectiveness of the insulation of containers designed to hold hot beverages, but even to such subjects as the heat conduction of beverages in relation to their "thickness" (or viscosity) and their rate of "settling"—factors which have been shown to influence to a marked degree their heat-retaining properties. Again, when emergency equipment has to be procured in very large quantities (e. g., individual feeding utensils) it is essential that the choice of the various items should

be based on systematic studies of their design, robustness, and ease of stowage.

The problems so far discussed have been concerned mainly with the production and properties of foods suitable for civil defense feeding. A no less important field of study is the problem involved in the packaging and transport of food, whether for general civilian feeding, emergency feeding, or the supply of food to the fighting services.

Packaging and Transport

As regards packaging, the outstanding problem in the United Kingdom is the acute shortage of packaging materials, particularly of tin plate and of the fibrous materials required for sacks and wrapping. This shortage can only be met by the development and use of substitutes which have the necessary properties of impenetrability to moisture and air and which are sufficiently robust to withstand prolonged storage and subsequent handling. One incidental advantage of the use of such substitutes is, however, that they may lead to the adoption of packaging methods which have certain advantages over those used during the last war. Thus, foil-wrapping and the use of synthetic materials, such as pliofilm, are capable of substantially reducing the weight of, for instance, emergency ration packs—a point which is of importance both for civil defense purposes and for the fighting services.

As regards transport, it is now well recognized that the efficient conduct of a war places a most severe strain on a nation's road and rail services. Experience in the last war showed that one of the limiting factors in securing the optimum use of these services and facilities was the time taken in handling freight, which in turn is influenced by the size, shape, weight, and nature of the packages to be handled and by the extent to which freight handling can be mechanized. The existence of an emergency in any given locality due to enemy action, in which, for instance, one sector of the transport system has been badly disorganized, combined with a probable shortage of available manpower in such an affected area, would intensify the need for the greatest efficiency in all freight handling operations.

Protection and Salvage

Finally, there is the third general group of problems, namely, the measures needed for the protection of food stocks from deterioration or damage, and for their disposal if they are unfit for human consumption. The prevention of deterioration is, of course, a wide problem which affects the whole policy of stockpiling on a national basis, but it involves special difficulties when applied to the local storage of food supplies for emergency purposes, since such local stocks may on occasion have to be stored in hastily improvised premises.

Moreover, damage to food stocks resulting from direct enemy action clearly falls within the province of the civil defense services. In the last war such damage was limited to the direct and indirect effects of blast and fire, and much information is available regarding both the nature and extent of the damage likely to be caused by these hazards and the means of minimizing their effects. The development of new hazards resulting from radiation and from bacteriological and chemical contamination has, however, opened up a fresh series of problems on which scientific investigations and guidance will be required. These problems involve not only the determination of the nature and severity of the contamination, but an assessment of the risks involved in consuming the contaminated food. Indeed, the safe disposal of such food may itself involve a very real problem, quite apart from the practicability of salvaging operations.

Need for Research in Nutrition

By C. G. KING. Ph.D.

Civil defense planning, both in broad general outlines and in terms of each community, should include provision for emergency feeding of all segments of the population under a great variety of conditions that may reasonably be anticipated. The problem includes consideration of such factors as economic costs, organizational requirements, provision for adjustments of authority, equipment and supply requirements, utmost sparing of unnecessary risks to health, and the maintenance of civilian morale and efficiency.

Plans must be developed to meet possible emergencies on the basis of knowledge at hand, but there are many important specific areas in which research is needed to permit improvements beyond the measures that can be agreed upon at present.

Nearly all of the topics cited below are being studied in one or more laboratories. On the basis of anticipated rates of progress, however, it is believed that increased research is urgently needed to guide improvements in plans for food production, processing, distribution, stockpiling, and especially for efficient disaster service.

Bombing, Plant Explosions, and Incendiarisms

Burns

Recent findings, such as those of Rosenthal, have indicated that even simple measures, like the copious drinking of salt-and-soda water, are of practical advantage as early therapeutic measures for burns. Several investigators have reported that there is need for generous ingestion of good quality protein foods and an adequate source of calories to supplement blood transfusion and other emergency measures (S. M. Levenson et al.).

Additional information is needed with regard to (*a*) electrolyte metabolism and therapy, including consideration of potassium, sodium, magnesium, calcium, and acid-base balances; (*b*) the time factors for each of the related therapeutic measures to promote convalescence through successive periods after initial emergency treatment; and (*c*) the most favorable times for supplying protein, fat, carbohydrate, and vitamin intakes after the initial emergency period, and the optimum quantities of these substances, to promote convalescence. The high protein foods, such as milk, eggs and meat, offer physiological advantages, but they also present many difficulties with regard to cost, storage, sanitation, service, and acceptance under disaster conditions of feeding. Parenteral administration of fat offers promise as an emergency measure in supplying calories, but extensive research and testing are still necessary before introduction of such products into widespread clinical practice.

A careful study should be made of the optimum physiological use of foods, and then of the specific food commodities that would afford maximum practical utility under disaster conditions of feeding. This area of research should include, first, special consideration of the critically injured, but it should also include the less severely injured infants, children, and mothers, the sick, and the aged.

Traumatic and Surgical Shock

Additional information is needed concerning the specific nutrients and practical foods that would be of greatest value in promoting convalescence from shock and concerning the rates at which high caloric feeding should be resumed after initial emergency treatment. These therapeutic measures should be studied independently of research on burns, even though the findings might be very similar in

Dr. King is scientific director of the Nutrition Foundation, Inc., New York City. *His paper was presented before the scientific section of the combined conference, December 3, 1951, at Church House, Westminster.*

specific instances. There is information to support the use of foods high in protein, but the ratios to available carbohydrates and the rate of increasing the caloric content are not well defined.

Radiation Sickness

Numerous claims have been reported in the literature concerning practical benefits to be derived from increased protein, vitamin, and other nutrient intakes. Most of the claims, such as those involving polyphenols, vitamin B_{12}, ascorbic acid, glutathione, cysteine, glucuronic acid, and methionine, have not been adequately confirmed or disproved either for animals or for man. Hence, a systematic study of the individual vitamins and other nutrients should be undertaken to supplement the information that has been reliably established. Each substantial lead should be tested clinically at the earliest opportunity under the auspices of investigators whose work will be widely accepted. The nature of the problem makes it evident, however, that most of the work must be done with experimental animals, rechecking with different species.

Both preventive and therapeutic aspects of the problem should be studied, first in terms of specific nutrients and then with reference to acceptable and available commodities.

Biological Warfare

Special diets were found to have a significant bearing upon convalescence from infectious hepatitis during and after World War II, but there does not seem to be adequate evidence concerning emergency and convalescent diets that would be of benefit in the event of biological warfare attacks. Biological warfare agents which might be used include bacteria, toxins, hormones, and viral agents. At least one very promising lead has developed with regard to virus infection injury and another dealing with bacterial infection. In neither case has the specific nutrient been identified.

Prospects to be studied should include the large-scale use of sulfa drugs and antibiotics. Assured techniques, qualified personnel, and specific plans for rapidly sampling and testing foodstuffs, soil, water, and the atmosphere for actual or suspected contamination should also be made available.

Chemical Warfare

Emergency and convalescent diets should be evaluated for each major type of chemical warfare agent that can be anticipated. There is reasonable expectation that the dietary measures that would be effective in aiding recovery from exposure to the various types of chemical warfare agents, such as nerve poisons, respiratory poisons, surface irritants, and specific kinds of radiation poisoning, would differ.

Frost Injury and Cold

Claims have been made for dietary measures that afford significant protection against impairment from exposure to cold, or that promote convalescence following injury. A few of the findings appear to be reliable and of practical value, but most of the reports have not been verified (or disproved) to a degree that would guide practical measures. If there should be prolonged warfare in arctic, subarctic, or high-elevation areas, or during a winter season in the temperate zone, information of this type would be of value to both civilian and military personnel. Among the nutrients for which claims have been made, for example, are high-carbohydrate meals, ascorbic acid, vitamin B_1, vitamin B_{12}, pantothenic acid, and vitamin B_6.

Starvation

Presumably there is little immediate risk of severe or chronic starvation of the civilian population within such areas as the United States and Canada. This Nation, however, may be called upon to feed large masses of partially starved civilians in other areas or to feed released civilian groups from military areas, so it is of critical importance that reliable information be at hand to guide feeding practices (*a*) during recovery from starvation; (*b*) during periods of severe demands upon total food resources when work output is urgent; and (*c*) to permit the most efficient adjustment of international food resources in all allied areas, in-

cluding those from which shipments are made.

A major consideration in this field of research is the merit of foods high in animal protein, vitamins, and mineral elements (recommended by many experienced clinicians) compared to low-cost, high-calorie foods, such as the cereals and oils, in achieving optimum convalescence from general starvation. More specifically, the problem is one of having available adequate data so that agreement may be reached among scientists, military officers, and civilians regarding an optimum adjustment of the ratio of calories to other nutrients under widely varying conditions of economic and physiological stress.

Another area for research deals with the requirements to conserve reasonable work output, health, and morale among population groups, adapted to varying degrees of limitation in food resources. This problem may become of strategic importance in the Far East, Near East, and many other sections.

Intravenous Feeding

For convalescent feeding of nearly all victims of simple starvation, intravenous feeding is not advised. However, for relatively rare individuals who cannot ingest food, there is need to develop satisfactory materials and procedures for intravenous feeding to prevent severe body weight loss and extreme weakness. Encouraging headway has been made in the use of fat emulsions, but the problem is not solved to an extent that would permit efficient large-scale production of materials.

Protein Deficiency

There is need to develop an objective and reasonably specific measure of protein deficiency that could serve both in mass nutrition studies and in individual studies. Serum albumin and globulin values do not furnish a satisfactory index of protein adequacy. Possibly electrophoretic and ultracentrifuge studies would permit identification of definite fractions whose variation would correspond in reasonable degree with the quality and quantity of protein ingested.

These studies could well be coordinated with a comparable approach to identification of the specific blood protein changes during severe catabolic and delayed anabolic phases of protein metabolism induced by stress.

Resistance to Stress

Adrenocortical functions appear to be of major importance in recovery from severe stress and shock induced by burns, trauma, hemorrhage, toxic materials, emotional stress, and exposure to cold. There is incomplete evidence that specific nutrients or groups of specific nutrients, including pantothenic acid, ascorbic acid, pyridoxine, polyphenols, riboflavin, vitamin B_{12}, choline, glucuronic acid, amino acids, fatty acids, and electrolyte balances, are important factors in building and protecting the defense mechanisms. Basically, each essential nutrient is probably necessary for normal functioning of all body tissues, including the specialized organs, but there is immediate need to gain a more specific and quantitative appraisal of the effect of transitory or long-continued high- and low-nutrient intakes upon resistance to specific stresses and upon the subsequent course of recovery. Quantitatively, at least, there is wide variation among the specific nutrients and among the different tissues.

Dehydrated Milk

Of the food commodities that have greatest promise of meeting civilian needs for disaster feeding, in addition to meeting demands for national health and economy during a long period of war or threatened war, dehydrated whole milk of high acceptability and dry, nonfat milk solids are perhaps the most crucial. Both products are needed as supplements to fresh, frozen, sterilized, and evaporated milk.

A specific problem beyond nutrient and flavor changes, in great need of solution, is to find how to dehydrate milk in a manner that permits rapid and satisfactory rehydration, free from visual defects and "chalkiness." This problem merits increased attention by scientists highly trained in colloid chemistry, working in liaison with others who are familiar with the biological and engineering aspects of the problem.

Emergency Testing

Simple, rapid clinical tests that could be used by technicians and nursing personnel should be developed for use in disaster areas, to gauge the status of emergency patients and thus facilitate their proper immediate care and establish priority of assignment to professional medical personnel. It is impossible for physicians in a given area to reach, examine, and diagnose patients rapidly enough to permit efficient care. Life and death decisions must be made quickly, and there now is no basis upon which to act with sufficient rapidity and accuracy.

Antibiotics

Intensive and prolonged use of antibiotics and sulfa drugs can have a marked effect, either favorably or unfavorably, upon nutritional requirements. These relationships should be studied as a guide in practical situations and as a means of discovering the basic relationships that underlie the observed effects. Furthermore, in the event of biological warfare or tropical warfare, this area of subject matter is likely to have first-rate importance.

Nutrition Surveys

Long-continued stress upon food resources would greatly increase the need for conducting and interpreting systematic nutrition surveys in diverse parts of the world. The requisite techniques, personnel, and plans should be developed, and initial surveys should be made to provide a reliable background for appraising trends in nutritional status.

Reference Data

Reference data pertaining to emergency care should be assembled, distributed, and used as a basis for training in each local and larger area. Broad and general plans can be developed on a national or international scale, but such plans alone will not suffice. Food resources, service facilities, stocked supplies, procedures, reserve transportation, and personnel will vary greatly from one community to another, so the available resources cannot be used efficiently unless the requisite data are properly assembled, organized, and distributed to responsible personnel in advance, on a community basis. Furthermore, there is the possibility that major fractions of entire communities may be rendered nonavailable for service, in a matter of seconds.

Conclusion

It is recognized that much work is under way relative to the topics outlined above, but there is urgent need for extending current activities in the directions indicated. On the more comprehensive and more urgent problems, additional groups should be organized to complement work already initiated.

It is respectfully suggested, also, that specific provision be made for coordination of food and nutrition research, including the independent universities and colleges, government agencies, and fund-granting agencies, to provide the greatest possible efficiency in the placement of funds and in the correlation of progress by independent groups working toward common objectives.

Other Papers on Conference

In addition to the papers from pages 607 to 643 other material on nutrition and emergency feeding problems, presented at the London Food Conference, will be published in subsequent issues of the *Public Health Reports.* Among these are "Special Feeding Problems in an Emergency," by Dr. Roy E. Butler, "Dietary Standards in the United States," by Dr. L. A. Maynard, and "Family Food Consumption Studies," by Dr. C. M. Coons.

Nutrition Lessons of the Berlin Blockade

By H. E. MAGEE, D.Sc., M.B.

The blockade of Berlin, begun toward the end of June 1948 and continuing until May 1949, has afforded lessons in nutrition that should be useful if a similar situation were to arise.

About 3 months after the blockade began, physicians from the Ministry of Health went to Berlin to examine the food and nutritional situation and to advise the occupation authorities on the feeding of the people in the Western Sectors. Systematic observations were continued during and after the blockade.

Studies were made of the food being brought into the city by airlift, the rationing of the foods, and the mechanics of the airlift, and samples of the population were medically examined from time to time. People were also inspected in factories, on the streets, in hospitals, and elsewhere. The advice given at the time was based on the findings of these studies and observations.

For all practical purposes the people of Western Berlin were dependent on the airlift for all their necessities. There was some smuggling from the Russian Sector and Zone, but this was quite small and could be ignored. The potatoes, vegetables, and fruit grown on the outskirts of the Western Sectors were evaluated on an energy basis and included in the rations. Besides food, the other necessities included the raw materials for industry, fuel, clothing, and medical supplies. Had the occasion arisen for a clear choice between food and any or all of the other imports, first place would, of course, have been given to food. No such decision was called for and the airlift was able to bring into the city reasonable amounts of all these necessities.

Dr. Magee, senior medical officer (nutrition) of the Ministry of Health, London, as adviser on food and nutrition to the British Control Commission, was in Berlin during the blockade. He presented this report before the scientific section of the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense, meeting at Church House, Westminster, December 4, 1951.

Capacity of Airlift

The big question posed by the blockade was whether there was enough suitable food and the planes to carry it to Berlin. As events transpired the airlift was strained to its utmost capacity, and the amounts of suitable foods available were often far from abundant. Because of these two limitations the airlift just about succeeded in providing sufficient food to keep the population "ticking over." Towards the end of the blockade with summer approaching, it was possible to do some stockpiling and to allow for small expansion of industry; but for the whole time the tempo of life of the citizen was well below that of a normal healthy community.

Foods Carried

The dominant aim was, of course, to transport to the city the maximum nutritive value in the minimum of space and weight. Fortunately, the air forces had had much experience, especially in eastern theaters of war, of transporting food and other needs to armies in the field. In the Berlin airlift maximum use was made of dehydrated and dry foods. The potatoes had most of their 80 percent of water removed, vegetables and fruits most of their 90 percent, with little or no detriment to their nutritive values. Sugar and fats are almost water-free; flour with its 13 percent of water, and oatmeal, macaroni, and other cereal products, and legumes containing 6 to 9 percent of water required no further treatment. Coal and oil for fuel occupied a larger place in the airlift than food. For the first 9 months coal averaged about 2,200 tons and food about 1,140 tons daily. Calculations showed that it would have been more economi-

cal to fly in hard biscuits, or even bread, instead of flour plus the coal required for baking it, but this scheme was rejected because of the risk of losses from stale bread and because it was considered important for morale that the Berlin bakeries should be kept going.

Another way of economizing bulk and weight is to provide as much energy as possible in the form of fat, since fat contains more energy per unit weight or volume than any other food. On our arrival in Berlin less than 20 percent of the 1,600 calories daily of the ordinary consumer (group III in the table) was contributed by fat. We arranged for the proportion to be increased to almost 30 percent of the calories. Insufficient supplies prevented any further increase. In a similar emergency fats might be increased up to 50 percent of the total calories, but such a high proportion of fat could probably not be tolerated for more than 2 or 3 months.

Little use was made of dried meat, and when it was issued it was far from popular. Canned meat and fish have the great advantage that they do not require cooking and so save fuel, but they get monotonous after a period and their weight is a disadvantage. Dried eggs were much appreciated. They can be packed in paper containers, and, mainly because of their low water content, they contain about double the energy of the same quantity of canned meat. The small ration of cheese which we were able to introduce in November was very much appreciated and so was bacon when it was available. In a similar situation more cheese, bacon, and ham for flavoring would make possible much more use of dried eggs, and transport would be economized.

Dried milk, whole or separated, is very economical on transport since it contains only about 4 percent of water. We wanted a ration of milk for everyone in Berlin, but this was not possible and it was therefore not given to anyone over 9 years of age. Dried fruit and jams were not plentiful at the time, but some were issued in place of equivalent amounts of cereal foods. They were always well received. They would have a useful place in a like emergency.

Pattern of Diet

The Berlin diet was austere, as can be seen from the table, and only the compelling force of hunger and the fear of political oppression would, I believe, make any civilized community continue to eat a similar diet for as long as the Berliners did. Austerity was no new thing to them; they had, in fact, been accustomed to hard times for more than 3½ years. Communities not so trained might react much less satisfactorily than the docile Berliners to sudden imposition of so monotonous a diet.

The average energy intake before our arrival was about 1,800 calories; it was then increased to 2,000 calories per head daily. Fortunately, the winter of 1948–49 was mild, and because

Original food rations for Berlin in grams daily and changes adopted (in parentheses) Nov. 1, 1948

Groups	Bread	Potatoes [1]	Cereals	Meat [2]	Fat	Sugar	Cheese	Milk (liter)	Calories	
									Pre-Nov. 1948	Adopted Nov. 1948
Heavy workers, group I [3]	600	400	80	100	30(40)	25(40)	−(5)	------	2, 498	(2, 609)
Workers, group II [4]	500	400	60	65	15(30)	20(40)	−(5)	------	1, 999	(2, 202)
Employers, group III	400	400	40(50)	40	10(30)	20(40)	−(5)	------	1, 608	(1, 882)
Children up to 6 years, group IVa	300	400	30	20	20	25	------	------	1, 786	(1, 786)
0–1 year	--------	-------	------	------	------	------	------	0. 75		
1–6 years	--------	-------	------	------	------	------	------	. 5	1, 653	(1, 653)
Children 7–9 years, group IVb	300	400	35	20	23(25)	40	------	. 25	1, 619	(1, 633)
Children 9–14 years, group IVc	300(350)	400	40	20(40)	25(30)	50	−(5)	------	1, 559	(1, 834)

[1] Includes vegetables. [2] Includes fish, bacon, ham, and dried eggs. [3] Limited to 4 percent of population. [4] Expectant mothers placed in group II from fifth month until end of pregnancy and given 500 cc. milk from 4 months before until 4 months after labor.

of lack of lighting, people spent most of the hours of darkness in bed. There were fairly general increases in weight after the increase in the rations, but this could be attributed also in great measure to the enforced rest and to the mild weather. Signs of undernutrition which were self-evident, especially in boys and adolescents, in men of large physique, and in parents of large families, declined in severity and frequency after the rations were increased.

Our clinical and other observations convinced us that 2,000 calories a day was a bare minimum and sufficed merely to keep the population at a subsistence level. In addition, the proportion of women, children, and aged was unusually high in Berlin. With all forms of

(*Continued on page 625*)

Nutritional status of individuals seen in Berlin in November 1948, March and October 1949, expressed as percentages

Group	Number	Dates of examination	Good	Fair	Poor
Men	105	November 1948	61.0	29.5	9.5
		March 1949	75.2	21.0	3.8
		October 1949	84.8	14.3	1.0
Women	52	November 1948	80.8	17.3	2.0
		March 1949	86.6	13.5	
		October 1949	92.3	5.8	2.0
Boys	98	November 1948	42.9	46.0	11.2
		March 1949	82.7	16.3	1.0
		October 1949	89.8	8.2	2.0
Girls	111	November 1948	64.9	27.0	8.1
		March 1949	79.3	19.8	.9
		October 1949	91.9	7.2	.9

NOTE: This table was included in the paper, "The Food and Nutritional Situation in Berlin During the Blockade and After," by Dr. W. T. C. Berry, Dr. P. J. Cowin, and Dr. H. E. Magee, published in the Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service, July and August 1951. The paper was discussed in conjunction with Dr. Magee's presentation.

The nutritional status of Berliners, shown in the above table, was assessed by paying particular attention to pallor, tired expression, lethargy, poor posture, diminished muscular tone and development, lack of luster of the hair, and diminished fat. By assessing these criteria and the all-around general appearance, the subjects were classified as in "good," "fair," or "poor" nutritional condition. In November 1948, many of the sample subjects showed all or most of the stigmata. There was slight improvement in January and in March 1949, but in October 1949, the manifestations had almost entirely disappeared, except in a few cases.

The improvement in all groups from November 1948 to October 1949 was striking, but specially so for the boys. Only 43 percent of the boys attained the "good" grade in the November 1948 examination, but 82 percent were in that grade in March, and 90 percent in October 1949.

The least improvement was shown by the men, and more often than not men of large stature showed more ill effects. Probably the rations were too small for the bigger men, and an appreciable number of men were still suffering from the effects of privation in Russian camps or from the effects of war service. The women were relatively much better nourished at all three examinations. The status of Berlin children in October 1949 was only a little less satisfactory than that of English school children during the same year. Of 3,181 English children examined, 93.8 percent were in "good" nutritional condition, 5.5 percent, "fair," and 0.7 percent, "poor."

muscular activity reduced to a minimum, 2,000 calories daily would probably just suffice for a community of average composition similarly placed, but morale would suffer and discontent would probably develop.

From a strictly health, apart from the political, standpoint, there can be no doubt of the wisdom of those in authority in Berlin of keeping industry going as far as possible. The Berlin dietary, however, should have been on the average about 300 calories more per head daily. Plans were made for an increase of about 150 calories a day, and they would have been put into operation during May 1949 if the blockade had continued. For a community of average composition expected to keep its main industries going on a moderate level, an average diet of not less than 2,300 calories should be provided.

If, however, full employment were the aim, then the target would have to be considerably higher than 2,300 calories. The diet should also be made less austere than the Berlin one, for example, by increasing the rations of meat (meat, bacon, fish, and eggs) and cheese, and by making more use of dried fruits, jam, and cereals of low moisture content, such as rice. Everyone should have a ration of not less than 9 ounces of milk in dried form and adolescents and children, not less than 18 ounces. Whole milk is better than separated milk because of its higher energy value.

Vitamins

Provided the flour supplied is of not less than 80 percent extraction, there would be no need to take special precautions about the vitamin B complex. In Berlin we found no clinical evidence of deficiency of any of the B factors. The flour was of 85 percent extraction or more, and on our recommendation it was fortified with calcium, as in the United Kingdom.

We reckoned that the average vitamin C intake in Berlin was probably 5–10 mg. daily; the dried potatoes and vegetables contained appreciable amounts. At no time were we able to find any evidence of scurvy, even after extensive search. Nevertheless, a ration of 150 mg. ascorbic acid weekly was made available early in 1949. In similar circumstances there would be no compelling need to supply a ration of ascorbic acid during the first 3 months of the blockade unless supplies were readily available. Concentrated fruit juices are obviously ruled out because of their bulk.

We did not find any evidence of vitamin A deficiency and only after prolonged search did we find a few cases of mild rickets in children. The Germans are accustomed to use "Stosstherapie" as a prophylactic measure, and it may be that children born before or early in the blockade were protected in this way. Supplies of concentrates of these vitamins were meager when we arrived in Berlin, and a ration of cod liver oil was arranged for children up to the sixth year, but this was not found to be possible for pregnant women. In a like emergency, pregnant and lactating women and children up to 5 or 6 years should have a ration of cod liver oil or similar fish liver oil.

Rations

The original Berlin ration scale was a relic of the Kommandatura days. It can be seen from the table that the energy content of the rations decreased from 1,786 for children 0-1 year, to 1,559 calories at 14 years. We tried to get this absurd scale altered to bring it into conformity with physiological requirements, and to get a special ration for adolescents, but for several reasons this was not done. In any similar situation comprehensive rationing of all foods would, of course, have to be introduced, and the plan of rationing would have to take strict account of the needs of every section of the population which might, for example, be classified into the categories suggested in the report of the Committee on Nutrition of the British Medical Association, 1950. The division into categories should be made as fine as possible so as to minimize the risk of gross inequalities in rations in relation to needs. Those of large physique, both adolescents and men, with large energy requirements would still remain a problem. If the blockade were to last for only 2 months or so, it would probably not be necessary to make any special provisions for them, but if it were to extend beyond this time then special arrangements should be made. In a small community this should not present in-

superable difficulties. In Berlin the large man of 6 feet or more, with emaciated appearance and vacant expression, who could not get enough to eat was one of the most pathetic sights.

Condiments

Table salt is most important; it is indeed indispensable and should be brought into the beleaguered city without delay. Pepper, chilies, mustard, and other spices should also be brought in. They take up little space and are important in improving the palatability of otherwise dull and unappetizing food. Carriage of salt to Berlin presented difficult problems. Some salt always manages to escape from the containers, and because of its hygroscopic properties it fouls the controls of land planes. Eventually, it was carried in seaplanes which flew from Hamburg to one of Berlin's lakes. Imports of alcohol should be restricted to spirits intended for the sick, but for the maintenance of morale the controlling authority might find it expedient to provide a ration for adults. In Berlin one of the breweries was kept going at a much reduced level of output, the object being, I believe, more to keep the brewery in working order than to supply any particular need. The issue was on a very small scale and went to clubs and to a few German restaurants which were able to open toward the end of the blockade. Tea and coffee should be provided in generous amounts; they occupy little space. The coffee issued to the Berlin population probably played an important part in the maintenance of morale.

Packing of Food

Flour formed the greatest bulk of the Berliners' food. It was carried in sacks which packed easily into the aircraft. Dried potatoes, vegetables and cereals, and dried eggs were put up in ration units in small rectangular cases made of strong paper. They were packed in cardboard boxes, which packed easily into the aircraft and were convenient to handle. Canned meats and fish were packed together in cardboard boxes; these fitted easily into the plane and were not difficult to handle, but the weight of the metal was a great disadvantage. The only alternative, dried meat, had also a serious drawback; people soon got tired of it.

Reconditioning Salvaged Food in Britain, 1943–45

In 1943 salvaged canned goods were cleaned under makeshift conditions (above). The average output was 1,700 cans per man-week. The other photograph is a view of a workroom in a specially designed reconditioning depot in 1945.

The depot was capable of sorting, reconditioning, and repacking 600,000 cans per 48-hour working week with a staff of 150, mainly women. The average output was 4,000 cans per man-week.

Food Sanitation in Civil Defense

During the scientific section meetings of the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense held in England last winter (see pages 607 to 626), sanitation considerations were explored in some detail. The five papers presented here were selected as being of particular interest and value to public health and civil defense workers in the United States.

Examination and Salvaging Of Food Supplies

By WINTON B. RANKIN, M.S.

The methods the Food and Drug Administration, Federal Security Agency, employs to determine whether foods are suitable for consumption after damage by blast, fire, or water, or contamination with radioactive materials are described here.

Radiation Hazards to Foods

A nuclear explosion may contaminate food with unfissioned materials, with fission products resulting from the explosion, or by inducing radioactivity in materials located near the explosion.

Careful analysis of available data indicates that there will be no significant induced radioactivity in foods which are far enough away from the center of an explosion to escape destruction. The slight radioactivity which may be induced in a stock located in a well-protected shelter near ground zero will be predominately short-lived. It will be virtually dissipated by the time salvage crews are able to enter the area for clean-up operations.

Thus, we are concerned only with fission products (beta-gamma emitters) and with unfissioned bomb material (an alpha emitter). These contaminants will be deposited as a fine dust or a mist upon containers or directly upon food or drink itself. They penetrate in the same manner as nonradioactive dust or mist. Materials in undamaged, well-closed warehouses, rooms, or packages will not be contaminated. Soluble radioactive elements dissolve in water or liquids, and thus may be carried in water through porous containers.

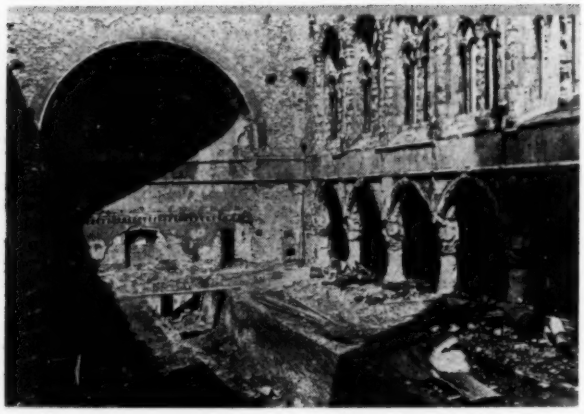
The contaminants are removed by washing waterproof containers with a detergent and by dusting or brushing other containers. Surface layers of bags, cases, or bulk food showing heavy contamination may be removed and impounded to permit decay of radioactive isotopes. Later analysis in a laboratory will show whether the contents are safe for consumption. Permeable containers, such as cloth bags and porous paper wrappers, may permit radioactive dust or mist to seep through and contaminate the food itself. Likewise, exposed food may be seriously contaminated. In such cases, surface contamination must be removed as completely as possible, and the field test described below must be applied to determine whether the food is safe.

Food and water which contain the following amounts of beta-gamma contamination may be consumed if other supplies are not available. (Emergency tolerances are those announced by the Civil Defense Administration and the Atomic Energy Commission.)

Time food or water is to be consumed	*Acceptable beta-gamma activity in disintegrations per minute per cc.*
10 days	200,000
30 days	70,000

Mr. Rankin is assistant director of field operations, Food and Drug Administration, Federal Security Agency.

Plymouth Food Office Incident



In October of 1939 Plymouth's old Guildhall was used as the local food office (upper photograph). In June of 1943 the Guildhall was bombed during a raid (center picture). The food office was reorganized and at work in a marquee 48 hours after the raid (lower photograph).

The consumption of these quantities of radioactivity during the periods indicated will cause less damage than withholding essential supplies from a stricken community.

A portable Geiger-Mueller survey meter will detect readily these tolerance levels of radioactivity.

Each survey team is supplied with a reference standard giving the equivalent of 200,000 beta-gamma disintegrations per minute per cc. The team places a sample of the contaminated material in a container of the same size as that holding the reference standard and compares the activities of the sample with the standard.

Samples with greater activity than the standard are not safe for use. Samples with less activity are suitable for use for a 10-day period. Samples with less than one-third the radiation given off by the standard are suitable for use for a 30-day period.

While this procedure is reasonably accurate for thin layers of liquids, research is required to confirm its reliability with solid or semisolid samples.

No effort will be made in the field to determine whether contaminated food may be used longer than 30 days. Peacetime tolerances for radioactivity are so small that an accurate measurement of them should be made with a conventional scaler.

Emergency tolerances for permissible alpha activity in drinking water or food also have been calculated. These are:

Time food or water is to be consumed	*Acceptable alpha activity in disintegrations per minute per cc.*
10 days	11,000
30 days	3,700

We do not have a portable field instrument which will measure satisfactorily these levels of contamination with alpha emitters. Possibly a portable scintillation counter would be suitable. Such an instrument is needed.

Except where a bomb fails to fission properly, the amount of beta-gamma radiation resulting from fission products is so much greater for the first month than the amount of alpha contamination from unfissioned material that we can forego direct measurement of alpha radiation during that period. If the beta-gamma

contamination is less than its tolerance value, the alpha contamination is below its tolerance value.

These emergency tolerance values should not be applied beyond 30 days.

Crops which grow on soil heavily contaminated with radioactive elements, and seafood which grows in radioactive waters, may take up significant amounts of radioactivity. This hazard will not develop suddenly. After the acute emergency following a nuclear explosion, perhaps after 30 days or more, food coming from radioactive soils or waters should be examined in the laboratory to determine whether they contain more than the peacetime tolerance for radioactivity.

Blast and Fire Hazards to Foods

The technical problems associated with food salvage following blast and fire damage of war are essentially the same problems which accompany major blast and fire disasters in peacetime. Many major fires are fought with impure water from rivers or harbors; thus, we also must consider water damage.

Perishable products probably will deteriorate beyond salvage if located near a major disaster. If salvable, they should be cleaned as thoroughly as possible and cooked promptly to destroy harmful bacteria.

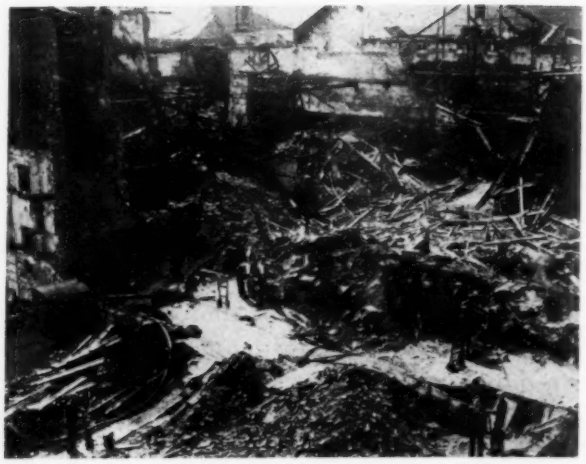
Semiperishable materials, such as dried fruits, deteriorate rapidly when they are mois-

Salvage of typical foods

Kind of food or package	Possible salvage procedure in case of—		
	Contamination with radioactivity	Blast and fire damage	Water damage (pollution)
Perishable:			
Fresh fruits and vegetables, fish, poultry.	Remove outside portions of lot containing most radioactivity. If remaining contamination is less than emergency tolerance, release interior portions. Washing of fruits and vegetables may be of value.	Look for contamination with poisons. If carriers of pathogens are present sterilize before using.	Wash to remove surface contamination. Cook to kill bacteria.
Nonperishable:			
Dried fruits and vegetables; flour and grains; bulk sugar stocks.	As above (except that washing is not feasible).	As above	Prompt sterilization and use of fruits and vegetables. Remove flour and grain which is not caked. Cook before using. Re-refine sugar.
Cardboard and paper containers.	As for flour, above. Removal of dust by brushing. Remove outer wrappers.	As above	If salvage attempted, sterilize food in water-damaged containers before it is consumed.
Sugar (bulk stocks)	As for flour, above	As above	Re-refine.
Canned goods:			
Hermetically sealed cans.	Wash outside of container with detergent, or remove radioactivity by brushing. Interior portions of stacks may be relatively free of radioactivity.	Look for and destroy cans with ruptured seams or closures. Remove abnormal cans. Look for spoilage from thermophilic organisms.	Sterilize surfaces of cans. Watch for pinholing of metal. Use damaged stocks promptly.
Containers with screw caps, friction type lids, etc.	As above. Test contents before releasing for use.	As above	Difficult to remove contamination from beneath or around closure. Sterilize foods before using.

Food Salvage Operations in England, 1944

At Streatham on the night of June 16, 1944, a fly bomb completely demolished a building containing 650 tons of foodstuffs. Salvage operations, completed in 6 weeks, resulted in recovery of 636 tons.



On the night of August 4, 1944, a fly bomb attack at Dudins Wharf, Bermondsey, resulted in a direct hit on a building containing 9,000 tons of cereals and oilseeds. Fires resulting from a burst gas main raged for 4 days. Salvage operations lasted 3 months, resulting in the recovery and utilization of 8,000 tons. The picture at top shows a general view of the site during salvage operations. The photograph below illustrates the problem of fly infestation which hampered salvage operations.

tened. If molding or decomposition has not set in when salvage is possible, damaged containers should be earmarked for prompt consumption; sterilization is required if the foods are polluted.

The surface of flour cakes when it is moistened. Some water-damaged flour may be salvaged by removing the uncaked material from inside bags or bins. Bulk lots of grains swell and form a solid mass; large quantities which have not been wet may be salvaged from inside elevators which have been subjected to heavy water damage.

Any food may be exposed to poisonous materials scattered about the storage area by blast. Often insecticides and foods are stored in the same warehouses, leading to the possibility of mass poisoning from the scattering of the poisons over foods.

Hermetically sealed cans may be ruptured by blast; they should be examined carefully for sprung seams which will permit spoilage. Decomposition resulting from damaged cans should be apparent in 7 to 10 days; adequate salvage will then be possible. Cold weather may retard the appearance of swells or leakers.

Hermetically sealed cans which are heated and cool slowly may develop spoilage from thermophilic organisms. The spoilage may not be apparent from the outside of the container. Such lots should be examined in a suitable laboratory.

Hermetically sealed cans exposed to pollution from water or other sources should be sterilized before release to the public. The cans may rust and develop pinholes before salvage.

If not, they should be used promptly after release because of the danger of pinholing.

Glass jars with screw caps, cans with friction-top lids, and similar containers without hermetic seals, and hermetically sealed jars with anchor- or crown-type closures are difficult to salvage following contamination with polluted water or other filth. Pathogenic bacteria lodge under the caps or beneath rubber gaskets and may be introduced into the food when the container is opened. Foods in such containers should be sterilized before consumption.

Foods in cardboard cartons, paper wrappers, and similar containers may be contaminated with toxic bacteria or poisons through breaks in the packages. Water damage to this type of package calls for adequate sterilization of the contents before use if salvage is possible.

If transportation and manufacturing facilities are available, large stocks of some foods, sugar for example, may be salvaged by refining even though they are heavily contaminated.

The table gives a summary of some of the salvage methods suggested.

The most pressing problems which remain unsolved are: how to measure alpha contamination in the field with portable equipment; and how to cope effectively with sabotage of the food supply.

A Safe Water Supply In Civil Disaster

By GORDON E. McCALLUM, B.S.
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Water, although not a food, is essential to life and therefore a necessary component of man's diet. Furthermore, water is important in the preparation, processing, and distribution of many foods. Any comprehensive study of the food aspects of civil defense, therefore, should consider those changes in the quality and quantity of the public water supply which are likely to occur in a civil defense emergency. Civil defense officials will be particularly concerned inasmuch as they may be faced with the problem of providing an emergency supply of water in the event of failure or serious contamination of the public supply.

Contamination of Public Water Supply

While similar in many respects water differs from other utility services, such as gas and electricity, because of its vital public health significance. Possible contamination of the public water supply is one of the greatest hazards to the health of the community. Although it is well recognized that water readily transports organisms causing such diseases as typhoid, cholera, and dysentery, its safety is seldom questioned by the citizen of the modern community. This record of safety and achieved assurance did not just happen. It is the result of more than 100 years of effort, study, surveillance, and careful sanitary control. Continuous research has brought about marked improvements in water works equipment and materials as well as in their operation and use. Furthermore, these resources are now under the control of more competent personnel. However, these safeguards in the form of modern collection and treatment of sewage and purification and protection of public water supplies are man made. Consequently, they can be suddenly destroyed, particularly so by man himself.

Wartime attacks upon civilian populations would break down many of these safeguards and at the same time intensify public health hazards. In addition there would be new dangers arising from possible use of special weapons of war. Scientific research on biological, chemical, and radiological substances indicates that some of these agents could contaminate public water supplies. Such contamination might occur as a direct or incidental result of attack, or by sabotage.

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Sewage

Sewage or organic contamination is most serious when it occurs within the water distribution system. Contamination in distribution systems may occur in normal times when pressures are reduced as a result of broken mains, heavy drafts for fire fighting, valve closures, and supply failures. Contamination may result from cross connections, backflow through faulty plumbing fixtures, and inadequate precautions taken during construction or repair operations. Incidences of such contamination will be greatly increased should the system be severely damaged.

Special Warfare Agents

Although the feasibility and effects of deliberate contamination of water is controversial, the vulnerability of the water works system to contamination by biological, chemical, and radiological warfare agents should be carefully studied. Water works structures which are most vital include unprotected transmission mains, water service lines connected to these mains, valve chambers, booster pumping stations, chlorination stations, and open reservoirs and other locations of water storage.

Precautions for the protection of these structures include automatic alarms at hidden work locations, backflow preventers, and automatic signal devices to give an appropriate alarm whenever an abnormal flow condition exists.

An automatic signal device to detect changes in chlorine residual might be useful in certain critical locations. Increased surveillance and intensified alertness are indicated.

Biological Warfare Agents

Biological warfare against human beings may be defined as the deliberate use of disease-producing organisms or their products to cause illness or death in a target population. BW agents may include bacteria, bacterial toxins, fungi, rickettsiae, viruses, and protozoa. It is generally conceded that the public water supply could be deliberately contaminated by certain of these agents.

It may be assumed that small quantities of BW agents may contaminate portions of a water supply system. Evidence that low doses of biological agents may be dangerous is suggested in the work of Kehr and Butterfield (*1*).

The agents of particular concern may be those not commonly found in water. As a result our normal public health safeguards might not be effective against them. We should not, however, rule out the possible use of common intestinal pathogens which by clever manipulations might be made to penetrate our water works defenses. The use of several agents simultaneously would complicate early attempts at detection and might make diagnosis of resulting diseases difficult.

Chemical Warfare Agents

The "war gases" may be defined as chemical agents used to create vapors, fogs, or aerosols that are poisonous by inhalation or, in the case of persistent agents, by contact and inhalation. Of the former, the mustard and nerve gases appear to be the most formidable.

Most effective poisons of the inhalation type are chemically unstable or otherwise not suitable for use as a water poison. However, some contamination of water might occur incidental to the tactical military use of these agents.

Pertinent details about chemical warfare agents, including procedures for their detection and control, are being assembled in a forthcoming Federal Civil Defense Administration manual on water utilities in disaster relief operations.

Radiological Warfare Agents

Deliberate attempts to contaminate water supplies with radiological agents are not considered likely at present. Other methods of contamination would appear more feasible. Contamination of reservoirs, however, and other open bodies of water might occur as an incidental result of an atomic bomb burst, particularly from surface or subsurface detonations.

Allowable concentrations of radiation in water for short periods during emergencies have been announced by, and are available from, the Federal Civil Defense Administration.

Detection of Contamination

Contamination in water supplies is routinely detected by the use of chemical, physical, and

bacteriological examinations well known to water works and public health workers. The primary object has been the detection of contamination by sewage or human intestinal discharges. The standard bacteriological test for coliform organisms, which indicates intestinal contaminants, is an important procedure employed by health authorities to judge the sanitary quality of a water supply. One of the limitations of such tests is the time—24–48 hours—which elapses before the results are known and control measures instituted. In the past decade many water works in the United States have placed increased reliance on the chlorine residual determinations, which can be quickly accomplished, thus permitting prompt plant adjustments to insure the maintenance of desired residuals. Experience with any given water under normal conditions indicates the amount of chlorine needed.

The problem of detection in times of disaster may involve the determination of increase in sewage contamination, as well as possible biological, chemical, and radiological warfare agents. In the case of sewage contamination, the intensification of the control procedures already used is indicated. Continued study and adoption of new procedures as they are developed will be necessary to deal adequately with BW, CW, and RW agents.

Improved Bacteriological Techniques

The standard bacteriological examinations are, as previously noted, rather time consuming. Recognition of this shortcoming no doubt hastened further development of a promising device known as the "membrane filter" (*2*). This filter consists of a paperlike cellulose ester membrane containing a high concentration of uniformly spaced pores of relatively constant diameter. The pore diameter may be made sufficiently small to remove practically all of the bacteria in the water being filtered. An interesting feature of this filter is the high flow rate under relatively low hydraulic head, a property attributed to the fact that the pore is shaped like a funnel with the small opening at the inlet surface. No attempt is made to remove the bacteria captured by the filter, but, instead, they are cultured in place. This is done by placing the filter, after use, on an absorbent pad containing culture medium which, when wetted, will diffuse upward through the pores to form a satisfactory growth substrate for the organisms.

This technique makes possible a substantial reduction in the time, labor, and space required for conducting bacteriological examinations. Moreover, the results are precise and the method may be readily adapted to field use. These advantages indicate this device to be especially valuable for prompt detection of biological contamination.

Research work with the membrane filter is being continued, including studies to adapt it for rapidly detecting BW agents as well as coliform and other intestinal organisms. Its usefulness in recovering pathogenic bacteria and fungi may be increased by the development of more highly selective nutrient media. It is unlikely, however, that a single culture medium will be found to be sufficiently selective for all organisms.

Detecting Radioactivity

The levels of radioactivity previously mentioned may be measured with presently available portable monitoring instruments. Detailed data on this subject is available in a recent bulletin, "Use of Commercially Available Portable Survey Meters for Emergency Fission Product Monitoring of Water Supplies, August 3, 1951," published by the University of Rochester, New York, together with the United States Atomic Energy Commission.

Decontamination Measures

Many water works officials attempt to carry chlorine residuals throughout as much of the system as possible. Breakpoint chlorination, a process by which all organic matter is quickly oxidized by high chlorine concentration, has been increasingly used during the past 10 years. It represents a significant improvement in disinfection in that it provides a residual of free chlorine throughout the distribution system. As compared with the usual combined chlorine residual, free chlorine is an extremely effective disinfectant. For these reasons this type of disinfection should offer greater protection against biological agents than conventional or marginal chlorination which is frequently employed.

Inactivation of Biological Agents

Standard water purification procedures, including presedimentation, chemical coagulation and settling, adsorption on activated carbon, filtration and pH control, offer satisfactory protection against many bacteria and fungi. The unsatisfactory performance of these treatment methods in the removal of certain viruses has been suggested in recent work on infectious hepatitis and anterior poliomyelitis. Disinfection with chlorine in high concentration, however, does appear to be effective against these viruses.

It is hoped that additional safeguards to supplement chlorination may be found in studies of new water disinfectants.

Under emergency conditions routine treatment and disinfection may of course be supplemented by boiling.

The decontamination of a water supply system following a suspected or known BW attack will not differ materially from the procedure normally used for accidentally contaminated systems or those being placed in operation for the first time. This procedure should include a thorough flushing of all parts of the system, including household service connections, and disinfection with a strong chlorine solution.

Removal of Radioactive Materials

Removal of radioactive materials from water is involved and uncertain. Conventional treatment processes are not completely effective in removing all possible contaminants. The removal of any chemical substance, radioactive or not, is dependent upon its physical and chemical nature. A common radioactive characteristic does not imply a common removal tendency when subjected to the various treatment processes. If radioactive materials were to be deposited in a stream or watershed, several natural agencies would be effective in reducing the amount which might finally reach the treatment plant. Among these agencies, the most significant are:

1. Natural decay which is continuous, unaffected by the chemical or physical state of the isotope, and in most fission products quite rapid, decreasing with time.

2. Dilution of the radioactive materials with the water reducing the concentration significantly.

3. Adsorption of the radioactive substances on suspended turbidity particles or other matter with subsequent sedimentation, and adsorption on bottoms and banks of streams and reservoirs.

Research is under way to determine the efficiency of the several conventional water treatment processes in removing radioactive isotopes. The procedures that can be employed by a rapid sand filter plant to improve its efficiency for removing radioactive substances are:

1. Increased dosage of coagulant to produce most effective floc formation.

2. Maintenance of the pH of coagulation as high as possible (a pH of 10 or 11 being preferable) by the addition of excess lime or soda ash.

3. Addition of coagulant aids such as activated silica, bentonite or other clays, and activated carbon.

The general function of these steps is to improve coagulation and thus increase adsorption by agglomeration. Whether or not safe water is produced will depend upon initial concentration of contaminants in the water, their susceptibility to removal, and the efficiency of the treatment processes. In any event, the finished water should be assayed for radioactivity. If the amount exceeds accepted tolerance limits, it should of course not be used.

Emergency Water Supply

Provisions for emergency water rations should be made in the event the public supply is interrupted or so contaminated that it may not be safe. Instructions should be issued to home owners regarding the storage, home decontamination, and conservation of water.

Careful planning will be necessary to assure that an emergency water supply can be made available to institutions, refuge centers, hospitals, and first aid stations. Various emergency sources may be employed, for example, water contained in local covered storage reservoirs which may be used without special treatment, and nonpotable or contaminated supplies which are first made safe by filtration, disinfection, or both. Equipment needed will include mobile water treatment, filtration, chlorination

and pumping units, hose lines, and tank trucks. Pre-disaster preparations should comprise an inventory of available trucks, including water sprinkling, milk, and petroleum products trucks, as well as plans for cleaning them.

Conclusion

In the event of enemy attack upon a community, its public water works system may be seriously damaged and the water supply subjected to gross contamination by sewage or special warfare agents. Also, in the immediate period following disaster, huge drafts may be placed upon the system to supply water for fire fighting. This, too, introduces additional hazards to the safety of the supply. Under these circumstances there may be a shortage of water over a considerable period, and water that is available may require special treatment. These effects can be minimized, however, by proper planning and preparation.

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Milk Control Planning For Civil Disaster

By GORDON E. McCALLUM, C.E., JOHN D. FAULKNER, M.S.P.H.E.

In event of attack on major population centers, milk pasteurization plants and cold storage facilities, as well as transportation and utility services, are likely to be destroyed or their operations disrupted. Following such disaster, immediate measures must be taken to conserve and protect the target city's milk supply; to provide for its adequate processing for the health protection of consumers; and to insure milk distribution to those immediately requiring it.

Considerable attention has been paid in the United States in recent months to the development of plans by Federal (*1*, *2*), State, and municipal governments, and by industry (*3*) for dealing with milk supply problems likely to arise in event of large-scale civil disaster.

In the United States, the milk production and processing industries are decentralized over a vast geographic area, and all of our major cities have developed their own milksheds from which they obtain a large proportion of their fluid milk supply. Sanitary control of milk production and processing, as a preventive measure against transmission of milkborne disease, is extensive. This control is exercised chiefly by State and local authorities, and not by the Federal Government. Practically all market milk sold in the United States is pasteurized, using a time-temperature combination of either 143° F. for 30 minutes or 161° F. for 15 seconds. Raw milk for pasteurization is usually transported from the dairy farm to country receiving stations, and thence to the pasteurization or processing plant, or to the plant direct, by automotive equipment. Although some milk for pasteurization is shipped to distant markets by rail, refrigerated or insulated automotive tank trucks are customarily used to haul raw milk great distances.

Diversion of Fluid Milk Supply

As most dairy farm producers of milk for pasteurization are not located in the immediate vicinity of our large urban centers, it is unlikely that many would be damaged or seriously affected by enemy air attack on a given target city. Conversely, many milk processing plants of an attacked city might be destroyed, seriously damaged, or otherwise made inoperative. Therefore, it is necessary to plan for emergency

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diversion of the city's raw milk supply to previously designated pasteurization plants, other milk processing plants, or to cold storage facilities in outlying areas and nearby communities. Routine automotive transportation of milk from dairy farms to receiving stations and processing plants affords a high degree of flexibility in developing diversion plans.

Emergency Milk Processing Facilities

Civil defense authorities of each potential target city must develop plans in conjunction with the local milk industry for the use of specific facilities in outlying areas which can receive and pasteurize portions of the diverted supply. These facilities should be earmarked according to their maximum operative capacity on an emergency basis, and agreements obtained for their use in civil disaster. Each milk receiving station should be assigned at least three alternate emergency processing plants and, where considered necessary, each milk producer should be assigned at least three alternate receiving stations or emergency processing plants, listed in a predetermined sequence to be followed for delivery of milk if it becomes necessary to divert the supply.

The requirements of each emergency processing plant for auxiliary equipment and supplies should be carefully noted to enable the plant to pasteurize and handle a portion of the diverted supply. Arrangements for the procurement of such equipment and supplies must be included in over-all civil defense plans.

Following large-scale civil disasters in the United States, in some instances the supply of fluid milk available to the stricken area is likely to far exceed the immediate need. The disposition of this surplus milk must be anticipated and plans made for its conversion if possible into concentrated milk products. If such arrangements cannot be made, other disposition must be planned so that emergency processing and cold storage facilities will not be overtaxed.

Public Health Protection

The sanitary control of fluid milk and milk products in times of civil disaster is of the utmost importance. The possibilities for disease transmission are multiplied many times, while routine control tends to break down or is overtaxed. From the standpoint of protection against milk-borne disease, it would be desirable to maintain existing sanitary standards for the production, processing, and handling of milk, and to intensify control procedures. However, this will not be possible in the immediate postdisaster period, and emergency standards and control procedures must be developed. In developing such emergency standards, departures from existing standards should be made only when clearly required. Every effort should be made to re-establish existing standards as soon as possible in the postdisaster period.

Immediately following the disaster, the efforts of the health department, or other milk control authorities, should be directed toward control of the pasteurized supply. All emergency milk processing facilities should be inspected as soon as possible after the disaster. and at frequent intervals thereafter, to determine compliance with minimum standards for proper operation. Inspection of producer dairies and receiving stations should be discontinued during this period, but producers should be forewarned that they must continue to comply with existing standards insofar as possible.

Bacterial examination and phosphatase tests of samples of pasteurized milk from each emergency processing plant should be made daily until operations have been stabilized, and at frequent intervals thereafter. Because of the laboratory workload involved, the assistance of industry laboratory technicians and facilities will be required. Plans should also provide for the use of laboratory facilities outside the target area. The bacterial examination of samples of raw milk from producer dairies should be discontinued during this period in order that laboratory efforts can be directed to the control of the pasteurized supply.

As a result of an attack, the emergency milk pasteurization facilities for a stricken area may be inadequate to meet immediate needs. Therefore, advance planning should provide for the issuance of instructions to emergency feeding centers, restaurants, and to the public on emergency methods for the pasteurization or steri-

lization of raw milk in the event that raw milk must be distributed.

Distribution of Emergency Milk Supplies

In civil defense planning for the distribution of foodstuffs in a disaster area, the nutritional need of special groups for milk must be given special attention. Infants, children, pregnant women, special dietary cases, and the injured will require milk in some form. Food supply plans should provide for the distribution of pasteurized milk direct from emergency processing plants to mass feeding centers, other communal kitchens, evacuation points, medical facilities, and stores. In the immediate postdisaster period it is likely that the establishment of emergency milk distribution centers will also be required. As soon as possible, however, distribution through regular retail outlets should be re-established.

Plans should provide for the use of existing milk industry automotive equipment for distribution purposes. If sufficient milk trucks are not available, other vehicles should be requisitioned and used solely for this purpose. During delivery, milk should be iced or otherwise maintained at a temperature of 50° F. or below.

In the immediate postdisaster period, pasteurized milk may have to be delivered in bulk rather than in individual containers. Special attention must be paid to the storage, handling, and serving of bulk milk to prevent contamination. Milk stored at mass feeding centers, other feeding establishments, and at emergency milk distribution stations must also be kept refrigerated.

Substitution of Concentrated Milk Products

A portion of the raw milk supply of a number of our likely target area cities is produced on distant milksheds which extend into several States. This milk is shipped both by rail and automotive tank truck to the cities concerned for pasteurization. An attack on a major transportation center, or simultaneous attacks on several large cities, could disrupt the Nation's transportation system to such an extent that a large portion of the raw milk supply of some of these population centers would be cut off temporarily. Where this probability exists, advance planning should provide for the substitution of milk powder and canned milk until the fluid supply is restored.

Some forms of concentrated milk would also be more adaptable to utilization during the immediate postdisaster period than fluid milk, for example, canned milk required for the preparation of infant formulas. Civil defense planning should provide for the procurement and distribution of concentrated milk products to meet special needs.

Rationing

In view of the large supply of milk available for fluid consumption in the United States and the decentralized nature of our fluid milk production, it does not appear that rationing will become necessary on other than a temporary basis in the immediate postdisaster period. However, restricted distribution of concentrated milk products may be needed because of shortages resulting from transportation difficulties.

Training of Auxiliary Personnel

The training of auxiliary personnel, both for key positions of milk processing plants and for emergency milk sanitation duties, is of the utmost importance. Auxiliary personnel will be needed to supplement the staffs of emergency milk processing plants and milk control agencies and as replacements for regular employees who become disaster casualties. Milk plants should select from among their own employees alternate personnel for each key position. Such personnel should be thoroughly trained in their alternate duties so that they may take over operations if necessary. Auxiliary milk sanitation personnel and laboratory personnel should be recruited and trained by the health department or other proper milk control authority.

Auxiliary Utilities, Equipment, Supplies

The various utility services in the fringe and outlying areas of major population centers are likely to be disrupted in case of enemy attack.

For those plants located in outlying districts and dependent upon the target area for power, consideration should be given to the need for standby or auxiliary power equipment in order to maintain operations and refrigeration in emergency processing plants in case of the destruction or serious disruption of the main power supply. Alternate methods for the operation of boiler units must also be considered. In addition, if the plants selected for emergency milk processing do not have auxiliary water supplies and are dependent upon the target city supply, consideration must be given to obtaining an alternate source of water. Auxiliary water supplies should be properly protected against contamination, and should be subjected to inspection and bacteriological examination as a pre-attack readiness measure.

Additional supplies of milk bottles, other containers, chemical detergents and bactericides, spare parts, and miscellaneous materials will be required by the emergency processing plants in event of a disaster. Advance planning must provide for the procurement and distribution of such emergency supplies. Consideration should be given to the storage of normal industry stocks in warehouses outside the area of probable destruction. It will also be necessary to plan for the emergency needs of dairy farm producers and milk receiving stations, including maintenance or feedstuffs for dairy cattle.

Rehabilitation of Damaged Facilities

It is possible that only a few of the plants supplying a disaster area may be destroyed or badly damaged by an attack, and if power and water are available, only a limited portion of the supply need be diverted. In case atomic weapons were used in the attack, all undamaged and partially damaged plants should be monitored for radioactive contamination prior to resumption of operations. Advance planning should provide for rapid monitoring and decontamination of milk processing facilities.

As soon as practicable after an attack, a survey should be made of complete and partial damage to, and contamination of, milk processing plant and cold storage plant facilities in the stricken area. Civil defense aid should be provided to restore operations where it is feasible to do so. Where immediate resumption of operations is not advisable, undamaged equipment and supplies should be salvaged for use in other plants.

Hazards of Warfare Agents

In general, we believe it can be assumed that if a milk plant is close enough to an atomic blast to be seriously contaminated with radioactive materials, it will have been destroyed or severely damaged by the blast or thermal radiation effect. Undestroyed milk and milk products in the central area of the explosion which have been exposed to heavy neutron-induced contamination should be disposed of. Milk products in undisturbed sealed containers which were exposed only to "fall-out" or "surge mists" will probably be safe for consumption; however, the outside surfaces of the containers must be washed to remove adhering contamination (*4*).

According to currently accepted principles, milk plants and their equipment exposed to "fall-out" or radioactive mists can be decontaminated by washing and scrubbing down exposed surfaces followed, if required, by the use of citric or muriatic acid. Since radioactive decay is entirely unaffected by chemical reactions the removal of induced radioisotopes, fission products, and unfissioned particles is necessary (*4*).

Milk and milk products directly exposed to chemical warfare agents must be destroyed. After an attack, facilities and products in sealed containers must be decontaminated before use in accordance with the instructions applicable to the agent or agents used.

The use of various biological agents by the enemy presents special problems which are now being studied by our military establishment and others. Procedures for rapid detection of the use of such agents have been initiated in the United States based on an epidemiological intelligence system for prompt reporting and study of disease outbreaks. Milk and milk products provide an excellent medium for the conveyance of some of the possible biological warfare agents that might be used; however, the processing of milk at high temperatures does provide a high degree of protection against

some of these organisms. It can be anticipated that the enemy will develop heat-resistant strains of pathogens and will also use toxins. Therefore, plans must be developed for the protection of milk plant operations against the possible introduction of biological agents through sabotage activity of enemy agents.

Research and Development Needs

Some of the problems related to milk supply in times of civil disaster, on which we believe further research to be required, are:

1. The use of chemical preservatives and sterilizing agents as a substitute for the heat treatment of milk.
2. Field screening tests for the rapid detection of radioactive and chemical contamination of milk, as well as improved laboratory procedures for the rapid detection of various biological agents and toxins that might be added to milk.

Coordination of Plans and Organization

Plans for milk control services in civil defense must be worked out in detail to fit the specific problems and probable disaster conditions for each likely target area, and must be integrated with the plans of communities designated to provide assistance and support in case of wartime civil disaster. They should then be carefully integrated into, and coordinated with, other civil defense plans at local, State, regional, and Federal levels. It is, of course, of paramount importance that the milk industry and its organizations participate in the development of all plans.

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Food Sanitation Problems In Emergency Feeding

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Emergency food sanitation problems are extremely complex. In solving these problems many of the specific procedures and techniques generally considered to be fundamental in food sanitation will have to be altered.

Factors which normally take precedence in the development of plans concerning administrative and scientific problems related to food supply and emergency feeding in civil defense operations include: (*a*) adequacy of sufficient amounts of principal food items required for the feeding of casualties, refugees, evacuees, and other homeless persons; (*b*) a consideration of the need for possible rationing and distribution of food and supplies; (*c*) the availability of emergency facilities and equipment for adequate storage, preparation, and service of food; and (*d*) food sanitation. We will deal only with food sanitation problems as they affect the operation and administration of emergency feeding programs.

The possibilities of disease dissemination will be greatly increased at times of emergency mass feeding so that adequate control measures will be essential. Therefore, the specific measures directed toward the protection of food assume added significance over those normally practiced.

The principal problems in the establishment of safe food service under emergency conditions relate to: (*a*) the use of equipment and the selection of foods in menu planning for varying degrees of emergency conditions; (*b*) the train-

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ing and mental attitude of all personnel responsible for handling of food, and (*c*) the development of emergency sanitation standards for controlling food-borne disease hazards which are likely to occur during a wartime civil disaster.

Sanitation Programs and Control Procedures

The application of known techniques to food sanitation problems will be complicated by the magnitude of the disaster. It would, of course, be desirable to maintain existing food sanitation and to intensify control procedures. Although this will not be possible, the basic and well-established sanitation principles discussed below will be applicable.

Storage Problems

One of the basic needs in the efficient operation of food service facilities is the adequate storage of food materials, including water, milk, and other food supplies. The storage problem is significant principally because emergency food service usually requires quantity feeding. Storage facilities, therefore, will need to be considered with respect to the construction and design of large storage utensils, refrigeration equipment, and the type of raw food materials to be used in the preparation of the finished food product. The use of packaged and bulk foods requiring little preparation and a minimum or no refrigeration appear to be indicated for use in emergency feeding operations, especially in the immediate postdisaster period.

Wholesomeness of Food and Drink

The wholesomeness of the food is directly related to the storage facilities of emergency feeding operations. This is particularly true when food supply plans provide for the distribution of perishable foods directly to mass feeding centers and other food service establishments. Refrigeration is required for such foods, whether they are distributed in small amounts, in packaged form, or in bulk. Unless adequate equipment and utensils are provided, the use of readily perishable foods should be limited to the amounts to be served at one feeding. In many instances the mere substitution of food and drink which do not require temperature control measures is advisable.

Cleaning and Bactericidal Treatment

The importance of adequate cleaning and proper bactericidal treatment of equipment and utensils cannot be overemphasized. Even under normal conditions, we encounter difficulties in obtaining compliance with this important item of food sanitation. Under emergency feeding conditions the problem will be extremely complex, since special adaptation of established techniques and procedures to varying types of emergency feeding centers will be required.

The public health significance of maintaining thoroughly clean multi-use eating and drinking utensils and equipment is well known. Not so well known, however, is the fact that some methods of bactericidal treatment are not effective unless all soil has been removed from the surfaces to be treated. This is particularly true when chemical germicides such as hypochlorites are used. Therefore, only after thorough cleaning of such utensils should one or both of the following bactericidal processes, or equivalent processes which appear suitable for emergency feeding operations, be applied.

1. Complete immersion in hot water at a temperature of 170° F. or above. The immersion time will vary from 2 minutes' exposure in water at 170° F. to approximately 30 seconds' exposure at boiling temperatures (*1*). This method we believe to be the preferred procedure for emergency feeding operations.

2. Immersion in a chlorine or other chemical germicidal solution. Strengths of solution and exposure times will, of course, vary with the agent used and its concentration (*1*).

To reduce both hazardous conditions and workload at emergency feeding centers, it appears advisable to utilize single-service containers and eating utensils, whenever practicable, as substitutes for multiservice plates, cups and glasses, and knives, forks, and spoons. The use of such single-service containers may also be required due to shortages of water for cleaning.

Other Sanitation Problems

Other matters of sanitary significance which have a direct bearing on safe food service at

emergency feeding centers, and which will require attention, are the personal health of the worker; safe source of water supply; sanitary disposal of excreta; fly, insect, and other vector control; garbage disposal; construction of utensils; and food salvage.

Food Service Personnel

The operation of emergency feeding centers will require the selection and training of large numbers of food service personnel recruited from both the restaurant and hotel industry and lay groups. An understanding by such personnel of the importance of food sanitation and the measures to be observed in food preparation and service is extremely important. Training of emergency food service personnel must, therefore, include these subjects in order to develop mental attitudes that will insure day-by-day observance of food sanitation principles.

Hazards From Special Weapons

Civil defense planning must prepare for problems that will arise in the event of enemy attack on civilian population centers with radiological, biological, and chemical weapons. The use of any of these special weapons will create special hazards with respect to the food supply of the disaster area. Problems of contamination, decontamination, and salvage are involved and must be provided for.

Recent documents (*2*, *3*) have suggested levels of radioactivity in water and food that can be permitted under emergency conditions following an atomic bomb blast or other nuclear explosion. The following table (*2*) furnishes guidance on acceptable values of radioactivity in water and food during a period of emergency immediately following a nuclear explosion.

While the emergency levels given in the table were established for water, the values are considered to be applicable to food as well. On the basis of present knowledge, however, the ingestion of any food which has been radioactively contaminated is probably a calculated risk, and should be avoided. In general, no foods should be used in emergency feeding operations, if the possibility exists that such foods were exposed either to radioactive or chemical contamination, until they have been monitored and released for use by the proper authority. Similarly, food equipment exposed to either form of contamination must be thoroughly decontaminated before use.

The use of food as media for the dissemination of biological warfare agents must not be overlooked. At present little information has been made available on this subject, although procedures for the detection of such agents are now being studied. It must be kept in mind that such agents may be used by saboteurs and could be introduced into the food supply of a critical defense installation. Protection of the food supply against the introduction of these agents is an important element in planning defense against biological warfare.

REFERENCES

(*1*) U. S. Public Health Service: Ordinance and code regulating eating and drinking establishments. Public Health Service Publication No. 37. Washington, D. C., U. S. Government Printing Office, 1950.

(*2*) U. S. Armed Forces Medical Policy Council for Departments of the Army, the Navy, and the Air Force: Handbook of atomic weapons for medical officers. Washington, D. C., 1951.

(*3*) U. S. Federal Civil Defense Administration: Levels of radioactivity in water and food that can be permitted under emergency conditions following an A-bomb blast or other nuclear explosion. Washington, D. C., 1951.

Emergency level for beta-gamma activity in water and food

Time water is to be consumed	Safe		Low, acceptable risk	
	Curies per cc.	Disintegrations per minute per cc.	Curies per cc.	Disintegrations per minute per cc.
10 days	3.5×10^{-9}	7.7×10^{3}	9×10^{-8}	2×10^{5}
1 month	1.1×10^{-9}	2.6×10^{3}	3×10^{-8}	7×10^{4}

Handling of Meat In an Emergency

By CLARENCE H. PALS, D.V.M.

In the United States our per capita consumption of meat is about 145 pounds per person annually. This is divided approximately as follows: beef, 63 pounds; veal, 9 pounds; lamb and mutton, 5 pounds; pork, 68 pounds. We also consume large quantities of poultry. This amounts to about 25 pounds of chickens, about 4 pounds of turkeys, and smaller amounts of ducks and geese per person annually.

Since meat is a highly perishable food, its preparation and handling must be surrounded by safeguards. The consumer of meat has a right to know that the meat he eats has been derived from healthy animals and has been handled in a manner to assure him that it is clean, sound, wholesome, and free from adulteration.

Meat Inspection Service

The animals we use for food, mainly cattle, sheep, goats, and swine are subject to a wide variety of diseases and conditions which might make their meat unsuitable for human food. Some of the diseases are transmissible to humans. One of the principal functions of any meat inspection service is to remove from food channels any meat which is not suitable for human consumption. This can only be accomplished by trained inspectors making careful inspections at all stages of the preparation of meat from the live animal until it is processed and delivered to the consumer. The live animals should be carefully examined on the day of slaughter by competent inspectors in order to assure the removal of those animals which are unsuitable for meat production. It is essential that competent veterinary inspection be provided so that an autopsy may be performed on every animal at the time of slaughter to assure the removal of those carcasses or parts of carcasses which are unsuitable for human food.

In the United States the Federal Meat Inspection Service is charged with the responsibility for inspecting all meat and meat-food products prepared in plants whose products move in interstate or foreign commerce. Meat and meat-food products prepared in plants that sell their product entirely within the State where produced are subject to any inspectional requirements of the city, county, or State in which they are located.

During the past year, our Federal Meat Inspection Service inspected nearly 90 million animals at the time of slaughter. This is more than 80 percent of the animals slaughtered commercially in the United States. About 300 thousand carcasses were condemned in their entirety and nearly 2 million parts of carcasses, principally heads, were condemned for human food and destroyed. Because they were found to be unsuitable for human food, nearly 1.75 million beef and calf livers were condemned for edible purposes and destroyed.

Another important function of the Meat Inspection Service is to inspect the preparation of meat food products, such as hams, bacon, sausage, loaves, canned meats, lard, and shortening, to assure that such products are clean, sound, wholesome, free from adulteration, and informatively, but not deceptively, labeled. Nearly 16 billion pounds of such products were prepared under the supervision of Federal meat inspectors during the past year.

Plant Supervision

The supervision of slaughtering and processing operations in about a thousand plants operating in all parts of the United States requires a well-organized group of veterinarians and meat inspectors working together. Antemortem and postmortem inspection is conducted by veterinarians along with well-trained lay assistants. The inspection of meat and meat food products after slaughter is performed primarily by trained meat inspectors working under the supervision of the veterinarians who have the over-all inspectional responsibility. Federally inspected establishments are required to be in well-constructed buildings supplied

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with abundant light, good ventilation, potable water, and an adequate supply of hot water and steam. Meat inspectors are present whenever the plants are operating. The Meat Inspection Service of the Federal Government has served as a model for inspection systems set up in the various States and municipalities.

Since meat is a highly perishable food and for the most part is utilized in the fresh state, rather elaborate systems of refrigeration have been provided. All meat packing plants make a practice of getting the meat into refrigerated rooms as soon as possible. Sometimes, the product goes almost immediately into a low-temperature freezer.

Disaster Effects on Meat Production

Any interference with the normal flow of livestock from the farm to the market and through the meat packing plants may result in serious losses. Problems which result from floods, fires, windstorms, and the like, may be greatly magnified in time of a national emergency. Many of our meat packing establishments are located in large cities which might be regarded as target areas. An attack by bombing or shelling could seriously interfere with the normal supply of such services as heat, light, water, refrigeration, and waste disposal.

An attack with atomic bombs could have vastly greater devastating effects because of their tremendous blast and fire power, and disruption of meat production resulting from such blast and fire is our principal concern.

In addition, there is the problem of radioactivity. Since it is unlikely that there would be large concentrations of livestock in an area where an atomic bomb is exploded, the number of animals exposed to the rays given off at the time of the explosion would likely be rather small. Such animals could be slaughtered and used for food if this is done before any symptoms of radiation sickness develop.

While the possibility of dangerous contamination from residual radiation is rather remote, this possibility should not be overlooked. Animals exposed to radioactive material such as the "fall-out" from an atomic bomb or from material in which radioactivity has been induced should be handled with caution. Persons handling such animals, whether farmers, packing plant employees, or inspectors, should be assured by monitors of the safety of approaching the animals before proceeding with slaughter. Such monitoring service would also assist the veterinarian in determining whether or not it would be safe to allow the meat from such an animal to be used for food. The monitor should also be available to advise the inspector concerning the location and nature of any radioactive material which might have been taken into the body of the animal. The kind of such radioactive material and its location would determine the disposition of the meat.

In making plans to safeguard our meat supply in the event of a local disaster, every attention has been given to making certain that the public hysteria will not be heightened by concern with the wholesomeness of the food supply. As a result, no consideration has been given to lowering accepted meat hygiene standards. Rather than thinking of lowering standards, it is our present belief that the public in time of stress is entitled to the type of planning that will give proper safeguards to its food and assure an adequate supply.

Studies of Occupational Cancer

By W. C. HUEPER, M.D., and THOMAS F. MANCUSO, M.D.

State health departments are in an especially favorable position to pursue occupational cancer studies, because of their organization and the authority vested in them by law. With few exceptions, State health departments have in their organizations the personnel and facilities essential for such investigations, including the three basic divisions—cancer control, biostatistics, and industrial hygiene—each of which has a special and separate interest in the problem of occupational cancer. The extensive practical experience available from communicable disease studies conducted in the past is an additional advantage to State health departments in the development of effective occupational cancer control programs, since the methodological approaches employed in epidemiological studies of occupational cancers are similar to those used for many years in the study of epidemiology and control of communicable disease.

The official status of State health departments provides them with opportunity to obtain access to, and collect a large variety of, pertinent records on cancer patients. Apart from information on death certificates, records of workmen's compensation boards, and histories of cancer patients kept by physicians, hospitals, cancer registries, industrial medical and employment departments, labor unions, and insurance companies, State health departments can draw on the facilities of the Federal Bureau of Old-Age and Survivors Insurance. In addition to data on the employment history of all insured individuals and on employers and industries, this bureau has the names and last addresses of all workers employed since 1937 in each State and in all industrial establishments in the United States. In States in which State disability insurance agencies exist, the State health department has an opportunity to obtain occupational data from living cancer patients.

Cancer control funds provided by the National Cancer Institute to the individual States enable State health departments to implement occupational cancer control programs. In addition, important exploratory investigations on occupational cancer may be supported by special cancer control grants.

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Industrial Exposures

State health departments possess information, usually collected by the division of industrial hygiene, on agents handled, products made, and processes used in individual plants. Supplementary data on special aspects of occupational exposures can be obtained when needed because State laws usually authorize representatives of State health departments to enter industrial establishments to study occupational health hazards to the workers employed and environmental industrial health hazards to the population living or working within their waste disposal zone. The study of occupational cancers can be extended through the cooperation of State labor departments to observation of the laws governing working

conditions, the use of safety devices, and the application and adequacy of accidental and occupational disease legislation in relation to cancer.

From the relatively specific character of the known and suspected occupational carcinogens, it follows that one must expect an uneven distribution of occupational cancer hazards among the various States, depending on the kind of natural resources present and the specific occupational activities and industrial operations carried on in the States. Each State, therefore, is likely to present an occupational cancer pattern of its own, and would do well to develop a study and control program adapted to its special needs and best suited for preventing, containing, counteracting, or eliminating its particular occupational cancer hazards.

State-Wide Control

The primary objectives of occupational cancer surveys are the collection of reliable data on the incidence rates, site, sex, race, age distribution, and nature and types of exposure to exogenous causal factors of cancers occurring among various occupational groups. Only when sufficient basic information on these aspects of occupation cancers and cancer hazards is available, is it feasible to develop and institute rational and effective control measures. Such studies may employ morbidity data, mortality data, or a combination of both, depending upon the type of investigation most suitable for the industrial conditions in a particular State and for the kind of tumors and population groups to be analyzed for the presence of occupational cancers.

These investigations on cancer morbidity and mortality are aimed at ascertaining whether cancers of certain sites tend to occur with unusual frequency in specific geographic areas or among selected industrial groups. To determine the number and to identify the types of exposed employees, as well as the types and intensities of exposures sustained, it is advisable to conduct surveys of industrial establishments and workshops which, according to information available in the State division of industrial hygiene, produce, use, or handle known or suspected occupational carcinogenic agents or devices. These surveys should be made either before beginning the investigations or supplementary to them.

Morbidity Studies

The use of morbidity data has a fundamental advantage over use of mortality data. In using morbidity data an attempt is made to determine all cases of cancer in the population surveyed regardless of whether the individuals are employed in a specified industry, are retired, living, or dead, or are engaged in other types of work subsequent to employment in a hazardous operation; whether the cancerous disease is present or symptomatically arrested; whether it was the cause of death, disability and retirement, or a passing event unrelated to the state of health at the time of the survey or to the cause of death, if death has occurred.

This method makes it possible to obtain information by which the total actual and organ specific cancer incidence among the total number of effectively exposed individuals can be approximated. By interrogation of living cancer patients, direct or indirect information on the employment history, specific exposures sustained, diseases preceding or accompanying the development of cancers and possibly related to their etiology may be obtained. The morbidity approach is the most suitable one, if occupational cancers with a high rate of cure, such as skin cancers, are to be studied. Since occupational cancers as a rule do not manifest themselves in an acute, epidemic-like fashion, to obtain valid results, it is necessary to analyze cancer incidence figures for a period of not less than 5 years, unless large population groups are surveyed or there is an unusually high frequency of cancers present in a restricted group studied.

Mortality Studies

Health Jurisdiction Records

Death certificates in the United States have been uniform since 1940, with revisions every 10 years, in accordance with the changes of the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. Although the data recorded on these

documents are not always reliable and sometimes are incomplete, death certificates provide one source of information on which studies of the incidence and the epidemiological patterns of cancer as related to industrial employment and occupation may be based. Death certificates are available on a state-wide basis from the division of vital statistics of the State health departments and on a regional basis at the local county and city health organizations. The data are recorded in "death volumes" in accordance with health jurisdiction—name of deceased, place of death, and date of death—and include information on age, sex, race, occupation, and social security number, in addition to the primary and secondary causes of death. In the production of the annual report of the State health department, the "State sheets" are prepared from information on mechanical punch cards on which essentially all the data on the death certificates are transcribed in coded form. For the coding of occupational and industrial employment data, the classifications of the Bureau of Employment Security, Social Security Administration, published in 1949 as "Dictionary of Occupational Titles," may be used.

Whenever such punch cards are available for an adequate number of years or can be prepared from the death volumes, a rough statistical analysis can readily be made to determine the total number of cancer deaths, the cancer deaths by organs, and their distribution among various geographic regions, occupations, industries, sexes, age groups, and races. Experience has shown that this particular methodological approach, when made on a State-wide basis, is not especially informative if industries are diversified and well distributed throughout the State. On the other hand, promising leads can be obtained by this technique, if the State has relatively well-defined industrial, urban, and rural areas and industries of certain types predominate in some areas but not in others, that is, if there are regions with differing industrial patterns and thus of different potential cancerigenic hazards. Such conditions may be reflected in regional differences in the total number of deaths from, and in the distribution of, cancers among different organs, sexes, ages, races, and occupations.

This methodological approach appears to have definite limitations when applied on a state-wide basis. The procedure, on the other hand, has been found more practicable for obtaining important leads on occupational cancer hazards when applied to specially selected regions, counties, or cities having either unusual types of industries or one predominating type of industry. Under such conditions it is possible to ascertain whether relatively definite evidence exists suggesting an occupational or environmental cancer hazard related to the activities of the particular industries present.

Whenever statistical analysis of the data on such a regionally restricted survey of cancer incidence based on death certificates demonstrates an excessive frequency of one or several types of cancers among the population group studied, a serious effort should be made to determine the reliability of the data used, that is, a check of the cancer diagnoses and personal medical and occupational histories should be made. Steps might then be taken to establish the validity of the evidence by broadening the study and elaborating upon the observations. The medical, employment, and insurance records of the industries located in the survey area might be investigated for additional information on the incidence of cancers among workers formerly or presently employed in the various operations, to pinpoint the potential carcinogenic operation or operations and to obtain a lead as to the nature of the carcinogenic agent or procedure involved.

Once this goal has been reached for a circumscribed population group or industry, it is rather simple to extend the procedure to other population groups and industries within the State where similar exposures might prevail. A master list of the names, birth dates, and addresses of persons who over a period of years died of cancers involving organs under study is prepared from the death volume. It is submitted to the industrial concerns of the area to be surveyed, with a request to indicate those individuals they had employed, the departments in which—and jobs at which—they worked and the dates of employment in each of these departments. In this manner pertinent information becomes available on exposures formerly sustained by deceased cancer patients while working for different employers. This

evidence then has to be analyzed and weighed for its significance in regard to the type and site of cancer studied.

If the results of such studies in occupational cancer epidemiology and etiology should prove their usefulness to a State health department, the above-described plan may be incorporated among the routine procedures of disease control. Under such a scheme the industrial concerns of the State are circularized at the end of each year with a list containing the names of cancer patients who died during this particular year. The industries are requested to check the names given against their personnel records and to note previous employment with the company and the years and types of employment. In States with cancer registries, this scheme can be applied also on a cancer morbidity basis.

Information of this type collected over several years and analyzed at regular intervals should prove of great value in discovering carcinogenic operations and occupations within the industries of a State or region.

Industrial and Occupational Group Data

The second survey method for the determination of occupational cancer hazards and cancer deaths utilizes the information on death causes by organizational groups of industrial workers either employed in the same type of industry, or following the same trade, or exposed to the same known or suspected occupational carcinogenic agent or agents. With this approach, it is possible to determine the relative incidence of death from cancers of various sites occurring among members of different labor unions or professional organizations, such as operating and nonoperating railroad employees, photoengravers, steelworkers, automobile workers, rubber workers, firemen and oilers, electrical workers, hod carriers, chemical workers, machinists, asbestos workers, boilermakers, teamsters, bookbinders, and technical engineers.

The records of some labor organizations contain data on the various employments and different types of work followed by their members. Types and durations of exposure to occupational carcinogenic agents which the individual members may have sustained during their lifetime can be deduced from this information. Whenever such detailed information on the occupational histories of union members is available, the degree of dilution of any evidence suggesting the existence of an occupational cancer hazard for the members of the organization studied is considerably reduced, and the significance of the observations made is thereby increased.

Information obtainable from death certificates from labor unions, and from records from disability insurance agencies and cancer registries also offers an opportunity to approach the epidemiology and etiology of occupational cancer from the viewpoint of exposure to the same occupational agent found in different trades and industrial organizations. Such studies are advantageous in that observations made among the members of one occupational group, if valid, should to some extent apply to other occupational groups having an identical exposure.

In this country, the Bureau of Old-Age and Survivors Insurance can provide the names and addresses of companies which manufacture or use similar products or operations in any particular State. The names and total employment histories of former employees of such companies, against whose accounts death claims have been made, can be obtained from the same source. Whenever the social security number has not been listed on the death certificate, an attempt may be made to obtain it from the informant. To verify the data furnished by the Bureau of Old-Age and Survivors Insurance and to extend them into the field of specific information as to the job or jobs held, a query should be addressed to the former employer. The cause of death can be ascertained from the death certificate. With such basic data on hand, a statistical analysis can be made to determine the incidence rate and types of cancers among members of different occupational groups having contact with the same known or suspected occupational cancerigenic agent.

Previous Employment Records

In the third method of studying occupational cancer, verified data obtained from death certificates are related to information on previous employments supplied from the records of the Bureau of Old-Age and Survivors Insurance (BOASI), Social Security Administration,

Baltimore, Md. This bureau has in its files a record of all places of employment of individuals who are covered under the Social Security Act. Since the information on employment available at this bureau includes all States in which an individual may have been employed for some time, it alleviates to a large extent the difficulty of assessing the role of all occupational factors resulting from the frequent migration of industrial labor from one State to another.

At present, the main limitation of this approach is that in many instances, especially in older workers, employment records of the insured group do not include the entire employed period of life, as the records were started only some 14 years ago (1937), and thus may not always be adequate for covering the entire known and long latent periods of occupational cancers.

The second deficiency of the employment information kept by BOASI is related to the fact that such data are recorded only for persons who are insured. They, therefore, do not apply to that part of the working population which does not fall within the Social Security Act in its original or recently amended form. However, with succeeding years, this source of information is certain to become increasingly valuable for the discovery of occupational cancer hazards, especially as the records of BOASI offer an opportunity to determine the cause of death of all deceased workers once employed in any plant or industry. Thus, attack rates of cancers with a predominantly fatal outcome can be computed from this material for the total effectively exposed worker population of an individual industrial establishment as well as of an entire industry.

Moreover, this methodological approach can be used on surveys of limited scope, such as the determination of the occupational background of cancers of specific organs. An adequate number of cases, however, must be used in such a study, and proper cognizance must be taken of the long latent periods of occupational cancers. Such investigations, undertaken on a state-wide or, perhaps even better, on a nation-wide basis in order to include any possible regional differences in the occupational or environmental cancerigenic spectrum, might yield within a relatively short time and with comparatively moderate efforts, valuable information on the epidemiology and etiology of human cancer.

Comments

From the foregoing discussion on the role of the State health department in the control of occupational cancer, it should have become evident that State health departments not only have an important stake in this problem but are in an especially favorable position of assessing its scope as to etiology, epidemiology, and control.

The active participation of State health departments in occupational cancer studies is most desirable since experiments in exogenous carcinogenesis, while providing valuable information, do not give results directly and unequivocally applicable to man. Observations in human carcinogenesis, therefore, are essential for definitely ascertaining the various physical, chemical, and parasitic factors in the human environment which may cause cancer in man.

In several industrialized European countries, especially England, official agencies in existence for several decades are charged with the routine study of industrial cancers. From these countries, extensive statistical data are available on the incidence, epidemiology, and etiology of occupational cancers. In contrast, there is an utter lack of similar information in the United States although our country possesses by far the largest industrial establishments. The time has come when this gap in sound public health practice should be closed, and obvious cancer hazards which affect not only certain occupational population groups but also, in part, the population in general, can be properly assessed and brought under effective control.

The various methods proposed, most of which have proved their practicability in field studies, provide State health departments with ready-made approaches to such investigations. Depending upon the organizational machinery in a particular State, and on the special occupational cancer hazards present, one or several of these methods may be found most suitable for the development of a program of occupational cancer control.

While it is possible, with the methods de-

scribed, to engage in the study of certain phases of the occupational cancer problem on a nationwide basis (determination of occupational background for specific organ cancers; prevalence of specific cancers among workers of specific industries; occurrence of cancers among different types of industrial workers and industries produing, using, or handling known or suspected carcinogenic agents), State health departments can make similar investigations more effectively and reliably if they create adequate facilities for such work.

The rapidly increasing importance of chronic disabling diseases in public health practice applies also to cancer. Doubtlessly, the most promising approach to attain a reasonable control of this disease is through an attack on those types of cancers, the occupational cancers, of which the etiology is known or can be ascertained with available methods.

Field Test Study of the Membrane Filter

Under the auspices of the Standard Methods Committee for the Examination of Water and Sewage of the American Public Health Association, a field test study of the membrane filter was begun July 1, 1952. The study is co-sponsored by the American Water Works Association and the Public Health Service. It will be continued for 52 weeks.

Twelve official laboratories accepted invitations to participate in the study: department of health sanitation laboratories of California, Georgia, Indiana, Kansas, Massachusetts, New York, Texas, and West Virginia; and water works laboratories serving Detroit, Indianapolis, New York City, and St. Louis. The study is being coordinated by the Environmental Health Center, Public Health Service, Cincinnati, Ohio.

The membrane filter technique for the determination of coliform organisms and the standard five-tube, three-dilution, most-probable-number procedure will be carried out simultaneously on all water samples. As many different surface and ground water sources as possible will be examined by each laboratory. In addition to the bacteriological procedures, the following physical and chemical tests will be made: pH, alkalinity, turbidity, color, hardness, and oxygen consumed.

It is expected that information from this study will enable the Standard Methods Committee to make recommendations relative to the applicability of the membrane filter technique to the examination of water.

A previous study of the membrane filter technique was reported by Harold F. Clark et al., of the Environmental Health Center, in *Public Health Reports*, July 27, 1951.

Representatives of each of the 12 laboratories participating in the present study attended a course given April 22–25, 1952, on membrane filter procedures at the Environmental Health Center.

Use of Field Tests in Evaluating Detergents

By J. L. MINKIN, M.S.

Can the evaluation tests for dishwashing detergents be used under practical field conditions?

What equipment and how much chemical knowledge is needed?

Can the tests be easily demonstrated to the restaurant operator?

Will the results be of practical value?

Sanitarians attending the New York State Public Health Environmental Sanitation Field Training Center at Buffalo, N. Y., are getting the answers to these and other questions concerning tests for dishwashing detergents. In the food and restaurant portion of the 12-week field training course, they are obtaining practical experience in evaluating detergents, experience which will aid them in making their routine inspections of restaurants and in helping the restaurant operator select a detergent for his particular needs.

Laboratory Evaluation Studies

Much work has been done on the laboratory level to evaluate detergents and to test their performance in dishwashing machines. Such recognized authorities as the National Sanitation Foundation at Ann Arbor, Mich., and the Environmental Health Center, Public Health Service, Cincinnati, Ohio, have made some excellent studies of these problems. Their tests, however, have been made with the use of rather elaborate testing and control equipment—photometers, analytical balances, experimental dishwashing machines, and other complicated laboratory equipment—and therefore cannot be carried out by the sanitarian in his routine inspection or by the restaurant operator.

A detergent that has been determined to be satisfactory under laboratory conditions in all probability will be satisfactory under field conditions if such factors as mechanical condition of the dishwashing machine, length of washing time, temperature of the water, and concentration of the detergent are at the recommended level. In addition, the actual use-value of the detergent will depend upon the efficiency of the operator and how much "elbow grease" and effort has been put into scraping and prerinsing the dishes. Since the laboratory test cannot control all of these variable factors, there is a need for a simple field performance-use test.

In our field training course we have developed a series of simple demonstrations to evaluate detergent properties, and a dish-soiling mixture for test-plate demonstration use in the single-tank dishwashing machine, the type most commonly used in restaurants that have mechanical dishwashers.

Detergent Properties

Sodium carbonate, a host of alkali cleaners, water softeners, balanced detergents, wetting agents, and synthetic cleaners are among the almost unlimited number of substances that are detergents. In our field demonstrations, the detergents are evaluated on the basis of tests for the following properties:

1. Ease with which the detergent dissolves in the water used.
2. Control of water hardness and film deposit.
3. Foaming ability.
4. Wetting ability.
5. Emulsification ability.
6. Ability to dissolve and deflocculate proteins.

Demonstration of Detergent Properties

The demonstration of detergent properties, using the basic chemicals usually found in a balanced detergent, illustrates dramatically that no single chemical has a high degree of all the desired properties. A good general purpose detergent must be a mixed and properly balanced product.

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The usual recommended detergent concentration ranges from 0.25 to 0.5 percent. For these simple tests, this is about one-half teaspoon of detergent powder in one-half pint of water. This measure is only approximate, but if all measurements are similar and the detergents have nearly the same specific gravity, the results will be comparable.

If detergents being tested vary from heavy granular materials to light fluffy particles, such differences should be taken into consideration in comparing the results of the tests. Measure by weight is, of course, more accurate than measure by volume.

Warm water should be used for these tests, to approximate actual operating conditions. The detergent solution may be mixed in a half-pint milk bottle, a glass, or any clear container.

The demonstration of detergent properties should proceed as follows:

1. *Ease with which it dissolves in the water.* Add one-half teaspoon of a basic chemical or a detergent to one-half pint of warm water and stir 25 times. A good detergent will be completely soluble and will yield a clear solution.

2. *Control of water hardness and film deposit.* Examine the solution carefully for cloudiness and sediment. Such deposits may be from the detergent itself, or they may be precipitated water hardness or insoluble soaps. These deposits can form films on dishes, making rinsing difficult. A well-balanced detergent will control water hardness by sequestering the hardness and keeping it in suspension or solution.

3. *Foaming ability.* After the detergent solution has been mixed and stirred, examine it for foam. Foaming ability is desired in detergents for washing by hand but must be limited for machine washing, since a high-foaming detergent will be quickly pumped out of a machine and spilled onto the floor.

4. *Wetting ability.* This property is desired in detergents to help separate soil from the dish. It can be demonstrated by putting a drop of the detergent solution on waxed paper. Water, with high surface tension and low wetting ability, will stand up in a spherical droplet. A detergent high in wetting ability will have a drop that flattens out over the waxed paper. Again, the difference may be demonstrated by allowing the drops to roll off the paper and examining the tracks. Water alone will not wet the waxed paper and will not leave a track. A good wetter will leave a wet track film. Plastic dishes may be used instead of waxed paper.

5. *Emulsification of fats.* Emulsifying ability may be shown by adding one-half teaspoon of vegetable salad oil to the detergent solution and stirring 25 times. A count in seconds of the time required for the oil to separate out at the surface will meausre this property of the detergent.

6. *Ability to dissolve and deflocculate proteins.* Although the above solution may be used for this test, a better test can be made with a fresh solution. Again add one-half teaspoon of detergent to one-half pint of warm water. To this add a few grains of dry cottage cheese. Then stir the mixture until it shows complete deflocculation and/or dissolving of the cheese. The number of times the solution is stirred is the measure of the ability of the detergent to dissolve and deflocculate proteins.

As each detergent is given each of the six tests, the results are recorded. After all the detergents under consideration have been tested, classification and selection is made by examining the scores of the products. Although small differences between detergents cannot be distinguished, the products can be classified as poor, fair, good, or excellent. The product scoring high in the greatest number of properties is the best of the group. In our classes, the trainees selected detergents from a group of over 25 commercial products for use in a single-tank dishwashing machine after seeing the demonstrations with the basic detergent chemicals.

The sanitarian and the restaurant operator are interested in selecting a suitable detergent for the available water supply. The chemical and physical characteristics of water, of course, vary in different parts of the country and at different times of the year. Even in a community in which the water supply is under competent water-plant-treatment control, the characteristics of the water may change during the year.

In addition to the basic water problem, the type of restaurant will influence the selection

of a detergent. The full-course-dinner restaurant will have use for several types of detergents, while a short-order bar may need only a single detergent.

The final selection of a detergent for use in a particular restaurant is not a simple problem. In addition to the above factors, availability and ease of handling must be considered.

Test-Plate Demonstration

It is generally agreed that the best test of a detergent is a use-performance test under normal operating conditions. This test can be made by using separate soils and a series of tests as given above, or by using a standard test soil applied to a plate. The latter method is the accepted practice. It has been used in laboratory and field appraisal of mechanical dishwashing installations. This method, however, presents two problems: (1) What should be the composition of a standard soil? (2) How should the soil be applied to the test plate? Breakfast, lunch, and dinner dishes all differ in the number of dishes per meal, the types of dishes, and the soil residue to be removed.

There is a difference of opinion as to whether dishes are soiled by separate food soils or by mixtures of food soils. From our experience here we have concluded that the soil on dishes is usually a mixture; it may be a mixture of fats, proteins, and carbohydrates, or of only two of these food substances. For our use-performance test, we made a simple standard test soil of these three food substances. The mixture is composed of easily obtainable materials, which can be mixed by simply stirring and shaking. Although the materials may separate after long standing, they may be easily remixed by simply shaking the mixture a few times. If a preservative such as sodium benzoate is used, the mixture has good keeping qualities.

The standard soil was made by mixing—

1 medium-sized whole egg
50 ml. evaporated milk
50 gm. white flour
100 ml. vegetable salad oil
100 ml. distilled water
5 gm. activated carbon
5 gm. sodium benzoate (as preservative)

The performance test is made by putting 1 ml. or 1 dropperful of the soil onto a plate, spreading it evenly over the central area, and drying by hot air, or the mixture may be placed on a hot plate. The test plate is then put into a tray of scraped and prerinsed dishes for the machine dishwashing. After the washing process, the test plate is examined for soil removal.

A properly operating dishwashing machine using the proper detergent and the recommended water temperature will completely clean the plate in the recommended washing time. In our single-tank dishwashing machine, the test-soiled plate was completely cleaned by washing at 140° F. for 30 to 45 seconds.

This test is a severe test of both detergent and machine. If the plate is not completely cleaned, one or more of the variable factors should be investigated. Failure may be due to the type of detergent, concentration of detergent, temperature, length of washing time, or mechanical condition of the machine.

Summary

Practical evaluation of detergents can be made by simple tests for each of six detergent properties. The six properties are: (1) ease of solution, (2) foaming ability, (3) control of water hardness and film deposit, (4) wetting ability, (5) emulsification of fats, and (6) dissolving and deflocculation of proteins. These tests can be made with very elementary measuring tools—a teaspoon, a half-pint milk bottle, and visual observation of results. A knowledge of sanitary chemistry is not needed for the tests to be demonstrated by a sanitary inspector or to be understood by the restaurant operator.

Although fine differences in detergents cannot be detected by these simple tests, the detergents can be classified broadly as poor, fair, good, or excellent.

After a detergent has been selected for use in a machine dishwasher, its performance can be tested by a test-plate demonstration, using a standard test soil. The test soil is easy to make up and use. The results show the over-all effectiveness of machine, operator, and detergent.

These simple tests are tools to be used by the sanitary inspector in his routine inspection work and by the restaurant operator in evaluating his detergents.

Sanitation Accomplishments *in* Local Health Departments

By L. M. FISHER, Dr.P.H.

Administrators of local health units, State and Federal health authorities, appropriating bodies, organized groups of citizens interested in the progress of public health, and ordinary taxpayers are all at some time concerned with the quality of the services performed by local health departments. In regard to sanitation services, they ask specifically: How many sanitation workers are needed to do the sanitation work in a local health department? What qualifications should these workers have?

It is believed that the studies in sanitation administration conducted by the Engineering Section Project, American Public Health Association, with funds provided through a research grant from the Public Health Service, are providing answers, at least in part, to these questions. These studies also suggest an objective method for evaluating sanitation programs in regard to adequacy of staff and general over-all efficiency.

Forty-two local health departments throughout the country participated in these studies (*1–4*). Each health department supplied factual data on health department personnel and time data. Some of these data are presented and analyzed here.

Dr. Fisher, an engineering field associate, was director of the Engineering Section Project of the American Public Health Association.
This paper was read at the twenty-first annual meeting of the Southern Branch of the American Public Health Association, Baltimore, Md., April 17, 1952.

Recording Methods

The environmental sanitation personnel of each participating health department recorded every activity requiring 5 minutes or more and the time required in minutes. Each activity was assigned two code numbers. One number indicated the kind of activity, such as a written inspection, a sample collection, a field trip, or a field visit; the other indicated the program in which the activity was carried on, such as food sanitation, milk sanitation, water, or sewerage (18 programs in all).

The same previously prepared code was used by all personnel, and the code numbers were checked by the health department's supervisor of sanitation. The daily activity reports were reviewed and edited by the same person throughout the study.

The daily reporting was carried out usually for 1 week, 3 weeks were skipped, and the reporting resumed for another week. The average time of participation by a health department was about 10 weeks, and the average number of men participating in the study was 370.

Field data were collected through November 1951. For each activity reported on the daily activity reports, an electrical machine accounting card was punched. Approximately 18 cards were punched for each daily activity re-

port, resulting in a total of approximately 250,000 cards reporting some 8 million minutes of time. This gave an average length of time for each activity of about 33 minutes. The punching of the cards received for the first quarter of 1951 was verified. Because of the small number of punching errors found, verification of cards subsequently punched was omitted. This cut the processing expense approximately in half. The accuracy of the unverified punching was deemed sufficient for our purposes. The total time punched for a given health department was usually within 5 percent of the figure called for by the official workday.

Evaluation of Services

Although it is generally accepted among public health workers that high-quality work is done by well-trained men, it seems to have been assumed in some quarters in the field of sanitation that anyone can make sanitary inspections. Many health officers have been obliged to accept the assignment of inadequately trained men because of the difficulty of showing that competently trained sanitarians accomplish more than persons less adequately trained. Furthermore, there is lack of agreement regarding the number of trained men needed to do a "good" job.

One of the chief obstacles in answering these questions has been the difficulty of determining when a job is well done. An approach to the solution of the problem of evaluating sanitation services is the use of milk sanitation ratings. If one accepts the thesis that a local health department has done a good job in milk sanitation when it attains a rating of 90 percent or better, using the formula contained in the sanitation evaluation schedule (*5*), a basis is provided for studying, analyzing, and comparing characteristics of health departments.

The quality of milk sanitation work is periodically rated by State or Federal health authorities in areas where the standard milk ordinance is enforced. Results of such ratings are expressed numerically, according to the procedures recommended by the Public Health Service (*6*). Approximate uniformity in rating by State health department personnel is accomplished by the periodic checking of ratings made by the Public Health Service at places selected at random against ratings made similarly and at the same time by State personnel.

Comparison of groups of health departments, based on over-all milk sanitation ratings

Characteristics	Upper third	Middle third	Lower third
Median rating	91. 2	87. 6	79. 2
Minutes of sanitation services per capita per year	9. 63	8. 38	7. 43
Percent of sanitation workers who were college graduates	35	35	28
Percent of units directed by masters of public health	67	44	33
Average educational ratings of men	[1] 3	[1] 3	[1] 3
Average educational ratings of supervisors	[2] 7	[3] 5	[3] 5
Percent of time in field	42	37	34
Percent of time in preparation	58	63	66

[1] Graduation from high school and the completion of 1 year of college work.
[2] Graduation from college and completion of 1 year of postgraduate study for which an advanced degree was awarded.
[3] Graduation from high school and completion of 3 years of college work.

The sanitation evaluation schedule provides a formula for combining the percentage of milk pasteurized, the rating of retail raw milk, the rating of raw milk sold to pasteurization plants, and the rating of pasteurization plants into a single over-all rating. This rating was used in the present study to divide 27 health departments operating under the standard milk ordinance into three groups: upper, middle, and lower thirds (see table).

The ratings for the three groups ranged from 97.5 to 67.8. All nine of the health departments in group 1 (the upper third) had over-all ratings of 90 or better; the average was 92.4, and the median was 91.2. The average for group 2 (the middle third) was 86.7, and the median was 87.6. Similar figures for group 3 (the lower third) were 78.8 and 79.2, 12 points below group 1.

Analysis of Characteristics

These three groups were studied to discover characteristics which might have a bearing

upon the quality of accomplishments. The principal characteristics investigated included time spent on general sanitation services, kind of leadership provided, educational qualifications of personnel, numerical adequacy of personnel, and activities which might reflect efficiency of effort.

The ability to make an adequate number of inspections is an important factor in maintaining sanitation at high levels. Therefore, the groups were compared with respect to the number of minutes of general sanitation services per capita per year provided. It was found that group 1 devoted more time to the whole field of sanitation than did groups 2 or 3, the average figures for the groups being 9.6, 8.3, and 7.4, respectively. The average for the upper third corresponds approximately to one sanitation worker serving 12,000 people, working 8 hours a day, 5 days a week, allowing 15 days' leave.

With respect to the qualifications of the health officer, it was found that 67 percent of those in group 1 had either a master or doctor of public health degree; 44 percent in group 2 and 33 percent in group 3 had such degrees.

The educational ratings of the supervisors of sanitation were 7 for group 1 and 5 for groups 2 and 3, according to the arbitrary scale set up for this study (see table).

There were seven engineers supervising sanitation in group 1 and three in group 3.

The percentages of college graduates among the sanitation workers in the three groups were 35 percent in group 1, 35 percent in group 2, and 28 percent in group 3.

The educational rating of the men was about the same for each group—approximately 3 (see table). The fact that there was no sharper differentiation in educational ratings for sanitation workers in the three groups may have been due to the fact that our method for determining educational ratings did not give any more credit, for example, for completion of several short courses, each of several months' duration, over a period of 10 years of service than for completion of a 3-day course during the first 6 months of service. This is an obvious weakness in our method.

Figures which may indicate efficiency of personnel are shown in the last two items of the table. For all sanitation programs for which figures were reported in the time study, group 1 devoted 42 percent of its time to field work, compared with 34 percent for group 3, and took only 58 percent of its time to prepare for field work, compared with 66 percent for group 3.

Food Sanitation Ratings

It did not seem profitable to make a similar study based on food sanitation ratings (*7*) because only 16 health departments reported these ratings. However, a comparison of health departments attaining a rating of 85 percent or more with those attaining a rating of less than 85 percent showed that the first group had a higher percentage of college graduates than the second group and that the educational ratings of the sanitation workers and the sanitation supervisors were higher for the first group. The comparison also revealed that a larger percentage of the health departments attaining an 85-percent or higher rating were supervised by engineers than those in the lower group and that the upper group provided more minutes of general sanitation services per capita than the lower group. In addition, the average age of the worker was lower for the first group than for the second group.

Sanitation Ratings

Many who have followed the history of milk sanitation ratings closely are convinced that this rating system is useful for measuring the quality of milk sanitation. It is being used increasingly to judge the quality of milk coming from distant sources for local consumption, and is playing an increasingly important part in the interstate shipment of milk (*8*). These ratings make it possible to put milk sanitation discussions on a scientific and factual basis. The need for establishing such ratings in other fields of sanitation seems highly important.

In establishing sanitation ratings, a sound public health reason should be stated for every sanitary requirement, and there should be a reasonably accurate method by which a qualified person can determine when satisfactory compliance has been attained. When satisfactory compliance as reported by local personnel

checks approximately with compliance as understood by regional or national personnel, the development of a standard is begun. If the degree of attainment can be expressed in figures, there is evidence that the problem has been well analyzed. Evaluation of a program in general terms, such as excellent, good, fair, poor, or satisfactory, indicates that our knowledge is not well systematized, and such evaluation is of less value since what one person may consider to be good another may consider only fair or even poor. Even when ratings are expressed in figures, however, we must not attempt to make too fine distinctions. For some time yet, until all our standards are well defined and their use widely understood, we must be content to deal in numerical approximations.

In this study we believe we see the beginnings of processes which will make it possible to support with actual statistics conclusions based upon judgment and experience. It seems evident that in order that this may be done more effectively it is necessary to establish ratings in other fields of sanitation such as those developed for milk and food sanitation.

Use of the over-all milk sanitation rating as a tool for evaluating sanitation programs must be made cautiously. Experience in the use of this tool still needs to be developed. It should not be used, for example, to compare health departments operating under the standard milk ordinance with those not operating under it. Such a comparison would be unfair, since the two classes of health departments are not on the same basis.

It should not be used to compare individual health departments with each other, but it should be further tested in investigating groups of health departments in order to see whether trends which are indicated in this study will continue when larger groups are studied and also to ascertain whether other differences may be noted between groups.

Only recent ratings should be used, since the quality of health department personnel is never static: it either improves or deteriorates.

Summary

1. Comparison is made of certain characteristics of health departments attaining high milk sanitation ratings with the same characteristics of departments attaining lower ratings. In general, the health departments having high ratings showed more time devoted to sanitation services, higher educational ratings of supervisors, more time spent on field work, and less time spent in preparation for field work than those having lower ratings.

2. The differences noted seem to set a pattern which suggests the need for more extensive study of the over-all milk sanitation rating, described in the sanitation evaluation schedule, as a tool for differentiating between efficient, well-staffed health departments and less efficient ones.

3. The development of additional standards in other fields of sanitation is urged in order that the effectiveness of sanitation programs may be measured.

ACKNOWLEDGMENT

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Hospital Beds for Tuberculosis

Tuberculosis control workers in many communities are daily confronted by the problem of long waiting lists for admission to tuberculosis hospitals and repeatedly emphasize the hardships resulting from the extreme shortage of tuberculosis hospital facilities. At times this situation has forced the adoption of unrealistic admission and discharge policies, to the general detriment of the public health program.

According to current State survey data, 39,000 tuberculosis hospital beds are still needed. However, this estimate is based on a minimum standard of 2.5 beds per annual death from the disease. This standard, established several years ago for want of a better yardstick, is no longer adequate, according to present opinion. With progressive improvement in treatment, fewer tuberculosis patients are dying of the disease. Therefore, for isolation treatment in hospitals, for aftercare, and for rehabilitation, we will probably continue to require more, not fewer, beds for some time to come.

Survey and Construction

With the passage of the Hospital Survey and Construction (Hill-Burton) Act of 1946, the country was provided with a systematic nation-wide hospital construction program utilizing financial aid from the Federal Government.

The program first aims to assist States in determining their needs for hospital and health facilities and in planning for the provision of needed facilities. Second, it assists the States in carrying out these plans by providing financial aid for the construction of needed hospitals and other health facilities.

Until now the emphasis has been upon the construction of general hospitals and health centers. The present situation in hospital construction was summarized in *Public Health Reports* for March 1952, pages 312–315. A review of State plan statistics for 1948 through 1951 appears in Public Health Service Publication No. 171 under the title, "Hospital Beds in the United States, 1951."

Only 3 percent of the 1,712 projects approved as of the end of 1951 were for tuberculosis facilities, providing less than 5,600 beds (see frontispiece). Since the Hospital Survey and Construction Act applies with equal force to tuberculosis facilities, it provides an excellent opportunity for material advances in tuberculosis control wherever the need exists. Financial assistance for construction is available to the States and Territories in meeting this costly phase of tuberculosis control. Local tuberculosis hospitalization needs should be made known to State hospital planning agencies, advisory councils, and the communities at large.

Tuberculosis Units in General Hospitals

The need to include adequate accommodations in general hospitals for the care of tuberculous patients has been recognized for many years. Tuberculosis services are being integrated with general hospitals for purposes of providing centralized services and medical care. In some instances this includes the common use of facilities, medical consultants, and other selected personnel for improved patient service and for education. Special tuberculosis hospitals and sanatoriums, integrated with general hospital services, are, of course, still needed in many areas. To help alleviate the shortage of tuberculosis beds, consideration should be given to including beds for tuberculosis patients in general hospitals. Past experience has shown this to be a highly desirable practice, and several States have adopted it in their plans for future hospital construction.

This material — and the frontispiece — was prepared by the Division of Hospital Facilities of the Bureau of Medical Services, Public Health Service.

The Detroit-Windsor Air Pollution Study

The dramatic Donora disaster of 1948 brought renewed attention to atmospheric contamination and its effects on health conditions. In several sections of the country significant studies and extensive control programs are now under way.

Some of these were reported upon during the 1952 Industrial Health Conference in Cincinnati, Ohio, April 19–26. The Detroit-Windsor air pollution study—an integrated project with industrial, local, State, national, and international participation—was the subject of a symposium on April 22 jointly sponsored by the American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association. Public Health Reports presents here, in brief, the six major papers.

Objectives of the Detroit-Windsor Air Pollution Study

PHR brief

The International Joint Commission of the United States and Canada was established by treaty in 1909. In article IX of the treaty, the Commission is given legal authority to study atmospheric pollution problems along the common frontier between the United States and Canada.

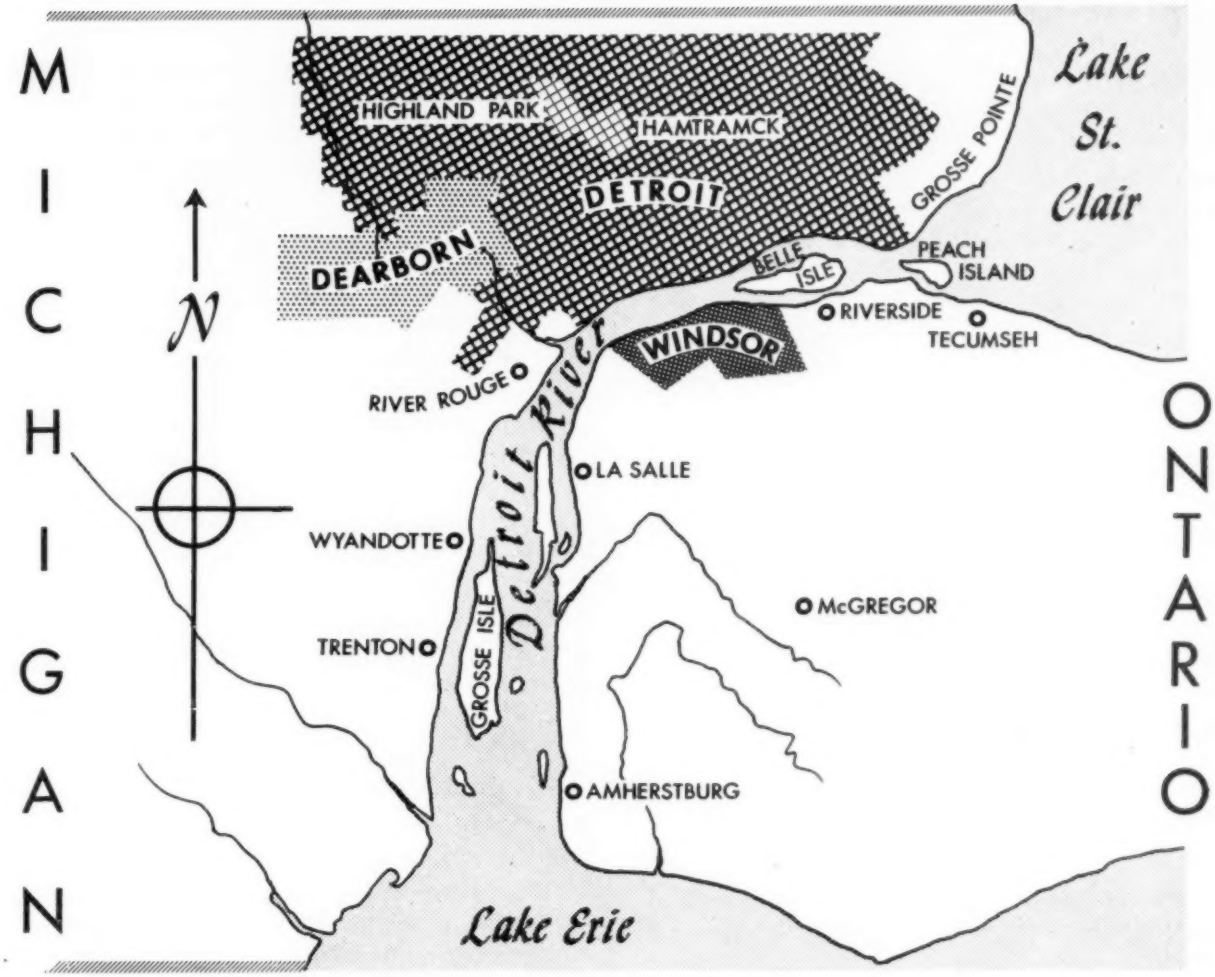
The Commission itself is not authorized to pass legislation, but it is required to make a joint report of every investigation with recommendations to both governments, who may then act upon the recommendations, giving them the force of law.

By George D. Clayton, B.S., sanitary engineer with the Division of Occupational Health of the Public Health Service, and chairman of the American Section, Technical Advisory Board on Air Pollution of the International Joint Commission of the United States and Canada.

As a result of complaints from Detroit, Mich., and Windsor, Ont., on both sides of the international boundary (the Detroit River), the United States and Canada in 1949 presented a joint reference to the International Commission, stating that the air in the vicinity of the two cities was polluted by smoke, soot, and fly ash discharged from vessels passing through the river. The joint reference requested the Commission to recommend remedial measures which would be economic and sanitary and to make a decision as to who would bear the cost.

The International Joint Commission established a Technical Advisory Board on Air Pollution, composed of three representatives from each government. The purpose of the board is to give technical direction to field work, to plan the studies on both sides of the boundary, to review the findings periodically, to discuss the significance of the data accumulated, and to make recommendations to the Commission. The board held its first meeting on May 12, 1949, at Windsor.

Although the joint reference outlined the



The area of the air pollution study

scope of the study, it did not define its area, except for providing that it include the entire length of the Detroit River. The Technical Advisory Board decided that the boundary would stretch from Peach Island at the north end of the river to Grosse Isle at the south end, extending 15 miles inland on each side of the river.

Early in the planning, it became apparent that sufficient funds to conduct the investigations would not be forthcoming from the national governments. It was therefore necessary and desirable to obtain the cooperation of those agencies within the community which are responsible for the health and welfare of the people. Various State, Provincial, local, and national organizations, including the CIO and the AFL, have thus been approached.

Advisory boards of leaders in the engineering and medical fields have been organized to assist in planning, guiding, and promoting the study. Many conferences have also been held with city officials.

Five objectives have been established for the Detroit-Windsor air pollution study.

Objective 1

Under the first objective—determination of sources, nature, and amounts of atmospheric contaminants resulting from combustion of fuels—the amount of pollution from fuel combustion of vessels, railroads, and domestic, industrial, and automotive sources will be ascertained.

The Ringelmann chart for estimating the intensity of smoke and the American Society of Mechanical Engineers code "Example Sections

for Smoke Regulation Ordinance" were adopted as standard.

One of the foremost problems for study is that of smoke emissions from vessels. For many years, the two cities have had smoke ordinances which were efficiently enforced by their smoke abatement departments, but no authority existed over vessels plying the international waters of the Detroit River. After several months of investigation, the data were presented to the Lake Carriers and Dominion Marine Associations, who joined forces in appointing a committee of combustion experts known as the Great Lakes Air Pollution Abatement Program Engineering Advisory Committee.

One phase of the committee's work was the study of the firing behavior of a boiler which had been removed from a vessel. As a result of this study, methods were perfected for the reduction of smoke to within acceptable limits for this type of boiler. Fuel specifications have also been established, and an educational program has been initiated.

Objective 2

To achieve the second objective—determination of sources, nature, and amounts of atmospheric contaminants resulting from industrial processes—it will be necessary to obtain mass emission rates from industrial stacks from which toxic materials and other contaminants are discharged into the atmosphere.

The Technical Advisory Board requested the division of industrial health, Michigan Department of Health, to obtain data from industry within the study area outside Detroit's city limits. Within the city limits, the bureau of industrial hygiene of the Detroit Department of Health was requested to assume similar responsibility. Because of the magnitude of the task, industry was requested to supply data on its own stack emissions. The excellent community spirit prevailing in Detroit and Windsor was shown by the support which industry has given to the study.

The larger participating industries were interested in acquiring more knowledge on the sampling and analysis of stack effluents. To meet this demand, a semester course of 18 lectures was established at the University of Michigan.

Objective 3

The third phase of the investigation—determination of effects of meteorological factors in the areas on the dissemination and diffusion of atmospheric contaminants—was undertaken with the cooperation of the weather bureaus of the United States and Canada and by personnel employed with funds provided by the United States Department of State and the Canadian Department of Internal Affairs.

A series of stations for sampling the atmosphere for solid and gaseous contaminants has been established in the study area, and the data from these samples are to be correlated by the weather bureaus. This correlation of data will indicate the diffusion rates due to meteorological factors as well as to the influence of temperature inversions on atmospheric contaminant concentrations. The data will also be used in studying the effects on health, safety, vegetation, and economy.

Objective 4

The determination of the effect of atmospheric contaminants upon health, vegetation, safety, and economy is probably the most difficult and time-consuming of all the objectives.

Because of the health implications posed by such acute incidents as occurred in Donora, there is great need to study the chronic, or long-range, effects of air contaminants on health. This is being undertaken jointly by the Public Health Service, the Canadian Department of National Health, and the Detroit City Health Department.

A more obvious problem is evaluation of the effects of atmospheric contaminants on vegetation, which is evident in the stunting of growth, loss of vigor, and reduction in crop yield. Air pollutants also present a threat to a community's civic beauty as well as to the prosperity of its outlying area. The technical board will request the assistance of a well-qualified organization to undertake this phase of the study.

There is need also to consider the effect of atmospheric pollution on safety. Studies will be made to determine what effects, if any, concentrations of various contaminants have upon aviation, automotive, and pedestrian safety. Appropriate organizations will be requested to

participate in studying the effects of air pollutants on aviation safety. This investigation will also include a study of the economic factors involved in air pollution and its effect on closed airports. The United States Weather Bureau and members of the technical board will cooperate in the undertaking of this study.

Objective 5

The last objective will be the determination of what controls are necessary, their cost, and by whom the cost should be borne.

Smoke is the only air contaminant for which workable data are available. Acceptable standards have been established for smoke emissions. Moreover, much research has been done on the control of smoke, permitting a fairly accurate survey of the cost of control procedures necessary to control smoke emissions within permissible limits. This is not true of other atmospheric pollutants. Data on standards for the emission of toxic gases and particulate matter into the atmosphere are insufficient.

During the investigative phase of the air pollution study, no attempt will be made to establish definite limits for the emission of toxic materials into the atmosphere surrounding industrial plants. No attempt will be made to establish limits for toxic materials found in community atmospheres. The study will seek to determine the effects of each individual contaminant, its relationship to other contaminants, and the practicability of certain control procedures. Only after careful review of all available information obtained during the course of the investigation will any attempt be made to recommend control measures for alleviating the atmospheric pollution problem.

Statistical Analyses in Air Pollution Studies

PHR brief

Air pollution can be studied successfully only when a wide variety of approaches is employed. In contrast to strictly experimental work where most environmental conditions are controlled, statistical analyses of air pollution must deal with phenomena upon which the influence of many important factors is unknown.

Experimental animals in a laboratory can be kept in a relatively stable environment while the magnitude and duration of exposure are varied. But the composition and environment of human populations can never be maintained at the same level. Although people may be exposed to similar atmospheric contaminants, they live and work under diverse conditions. Chemical substances in the air are found in complex mixtures.

The statistical approach to studying uncontrolled phenomena offers the best hope of finding solutions. To be of greatest assistance on an air pollution study, the statistician should be a member of the research team in the planning stages.

Design of the Experiment

In any investigation, the objectives cannot be fully developed until certain facts about the community are known. In the Detroit-Windsor study, maps were available in the office of the city assessor, showing the ownership and boundaries of all industrial properties in Detroit. City air pollution inspectors were assigned throughout the city to determine from the assessor's maps which plants in their districts were contributing to air pollution.

Industrial plants were classified by type of smoke emission—active and inactive solids and active gases—and were then divided into heavy or minor pollution classifications. This information was transferred in symbol form to census tract maps of Detroit. It was thus possible at the onset of the study to visualize where the atmosphere was being contaminated and with what type of contaminant. Additional information was obtained from the public utility company, from a newspaper, and from regional planning maps.

The biological phase of an air pollution study involves the delimitation of socioeconomic areas. Basic data for this objective must be as-

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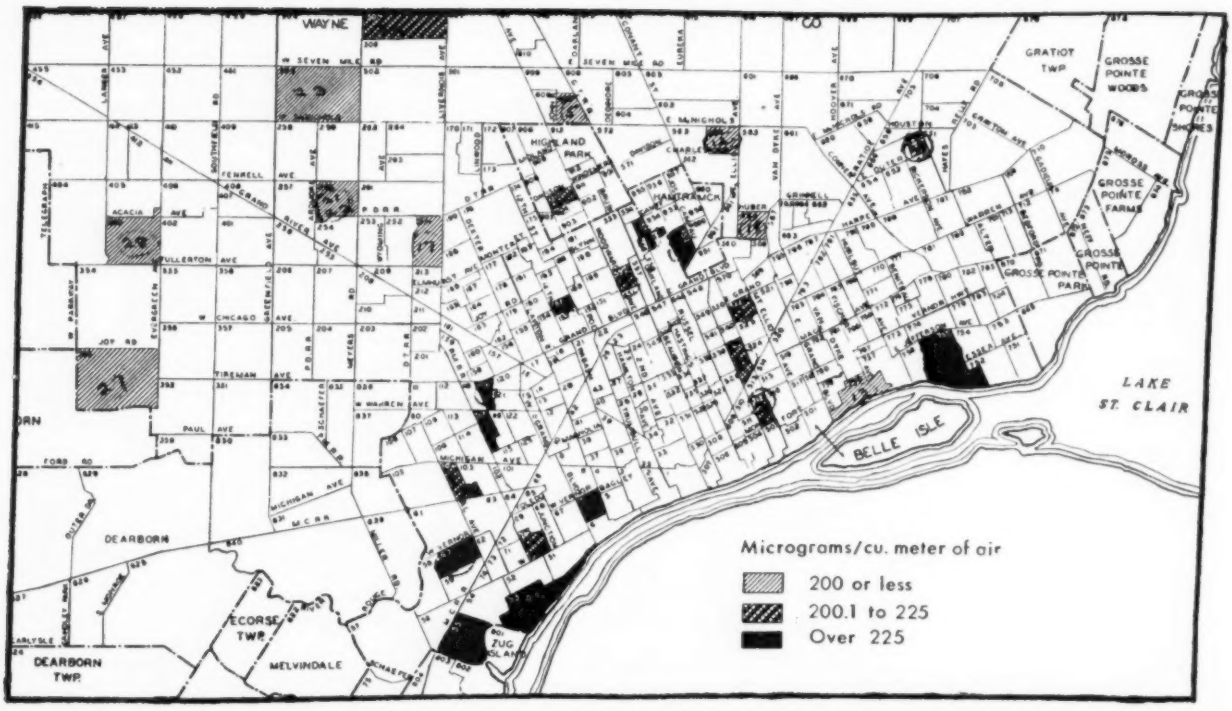

Figure 1. Census tract maps of Detroit are used throughout the air pollution study. This one shows the median weights (in micrograms per cubic meter of air) of total particulate matter based on air samples collected in selected census tracts in the Detroit area for the period May 7 through June 17, 1951.

sembled from a variety of sources, a task well suited to the statistician. In the Detroit-Windsor study, census tract information was sought from the United States Bureau of the Census on such topics as the 1950 count of population, 1940 census data for percent of nonwhite population, percent of foreign-born population, median years of schooling, percent of homes with mechanical refrigeration, and percent of owner-occupied homes.

A local sample survey made in 1946 provided economic ratings by census tract. The Council of Social Agencies furnished current data on relief cases, aid to dependent children, and old-age assistance. The juvenile court furnished data on the residence of youthful offenders. The interracial commission estimated changes in the proportion of Negroes since the 1940 census. The health department prepared information on vital statistics—total death rates and infant and tuberculosis death rates. Utilizing such information, the statistician prepared census tract maps, shading the variations within the city.

Figure 1 is an example of a census tract map used to pinpoint the amounts of total particulate matter collected in selected areas.

Once the sources of pollution have been spotted and the socioeconomic areas delimited, the groundwork for intelligent planning has been laid.

Operation of the Study

In the active phase of the study, the tasks of the statistician will multiply rapidly. Air-sampling stations should be located with regard to the adjacent human populations. The maps showing emission sources and classifying census tracts by socioeconomic status are needed to locate air-sampling stations. Census tracts should be grouped by pairs having relatively similar socioeconomic status but different amounts of air pollution. Since it was practicable to operate only a certain number of sampling stations, they were distributed on a random geographic basis among the approved census tracts.

An equally helpful study would be a statistical investigation of the health of people in sam-

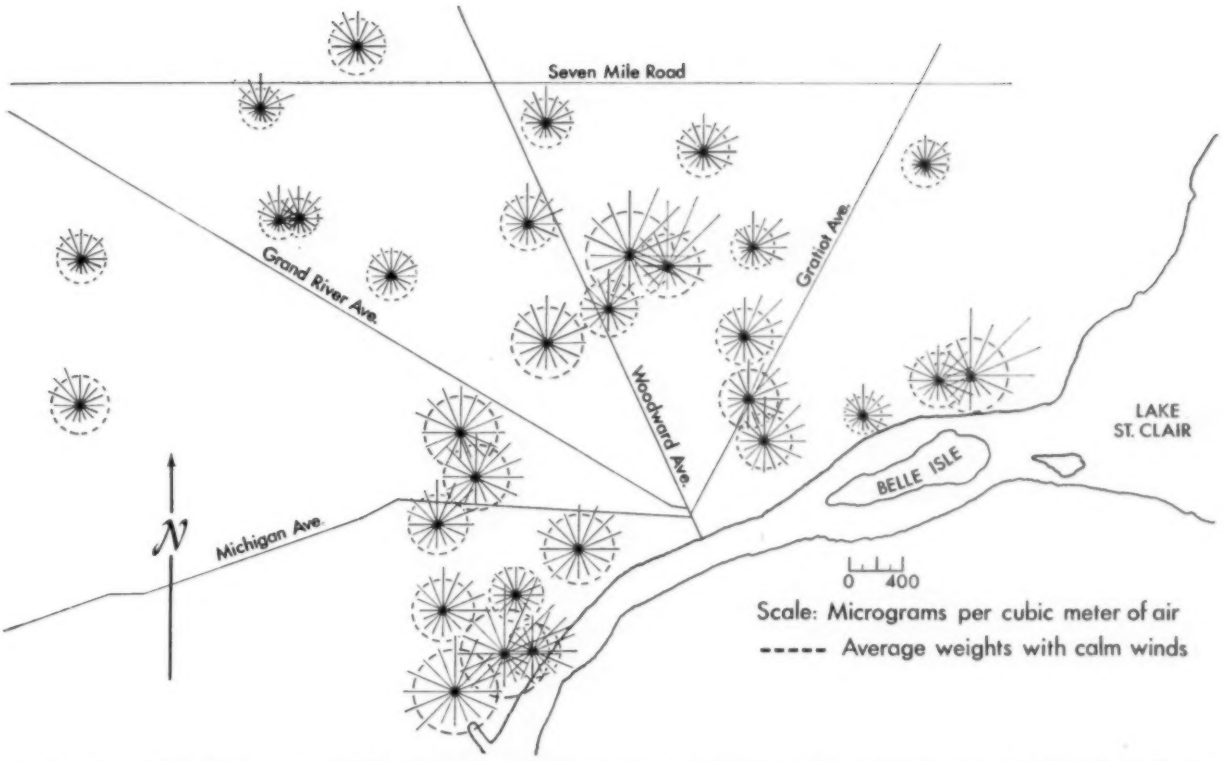

Figure 2. The above map of Detroit shows average weights (in micrograms per cubic meter of air) of total particulate matter according to wind direction for each of 31 sampling stations, based on daily air samples collected in the Detroit area, May 7 through June 17, 1951.

ple areas. Such a study might include a continuing record of the sickness experience of selected groups subjected to varying degrees of air contamination. Because of the infrequent occurrence of many diseases possibly related to air pollution, selection of the sample size is of major importance. The unit chosen for sampling might be a random selection of families in a designated census tract or in selected areas within the tract.

In planning the number of interviewers, estimates are needed on the average daily number of home visits to be expected of each worker. The time interval between interviews has been found to have a marked influence on the morbidity rates obtained. Field surveys of morbidity are but one of many possible means for the evaluation of health conditions. The statistician can assist in devising better and less costly methods for use of the other sources.

Analysis and Presentation of Findings

The validity of findings from any air pollution study will depend upon a comprehensive statistical analysis of the data. Such analysis should partially answer the following questions: Which areas are more heavily polluted in terms of specific contaminants? How does the concentration of various contaminants in different areas vary with changing weather? Is there a common behavior pattern of the specific contaminants? Is there any over-all measure of air pollution to use as an index in ranking different areas in terms of average air pollution?

The statistician will select appropriate descriptive constants to facilitate comparisons among sampling stations. The medians may be used to represent an average value of a given contaminant at different stations and to rank the stations with respect to average concentration of the contaminant. Since sample weights represent average values of the contaminant for time intervals of equal length, the median may be considered the concentration of the contaminant which was equalled or exceeded in the atmosphere during half of the period under investigation.

The degree of concentration at the various

stations can also be measured by selecting a given concentration value and determining the proportion of sample values which equal or exceed it. This approach can supplement the information given by the median value. By fixing the concentration values at a relatively high level, heavily concentrated areas can be identified.

To investigate the relationship between weather and air pollution, the day-by-day weights of total particulate matter for one station and the average daily weights for all stations may be plotted in a time series. Weather conditions may be compared with these graphs, and strongly associated cyclic patterns may be observed.

The amount of contamination at a given air-sampling station can be related to the prevailing wind direction. To do this, multiply each daily weight of total particulate matter by the number of half-hours in the day when the given set of wind directions existed; sum up all days of the study period, and divide the sum by the total number of half-hours in the study period for this category of weather conditions. A map can then be prepared to show a sampling station with bars radiating from it in wind directions (see fig. 2). The length of each bar is proportional to the amount of particulate matter observed when the wind was blowing in a given direction.

Environmental Studies—General Area Sampling

PHR brief

The population and industrial centers on both sides of the international boundary at the Detroit River may be considered as one area. A region of about 3 million inhabitants, it is one of North America's greatest concentrations of industry.

By Morris Katz, M.Sc., Ph.D., chairman, Canadian Section, Technical Advisory Board on Air Pollution, International Joint Commission.

Estimates place the annual domestic and industrial consumption of coal and solid fuels in the area at about 15 million tons on the United States side, and 650,000 tons on the Canadian side. Including the total from all sources, the coal consumed by vessel traffic on the Detroit River is conservatively estimated at 16 million tons. The average sulfur content of this fuel is at least 1.5 percent, and about 90 percent of the sulfur is released into the atmosphere during combustion. On this basis, approximately 430,000 tons of sulfur dioxide are emitted to the air annually from solid fuels alone, to be further augmented by the sulfur oxidation products from the combustion of natural gas, fuel oil, gasoline, and from such sources as metallurgical, chemical, and paper mill operations.

Among other toxic gaseous contaminants which have been found in this area are hydrogen sulfide, chlorine, oxides of nitrogen, and ammonia. Data obtained for these contaminants are meager in comparison with the continuous sulfur dioxide observations and, therefore, serve only to indicate the nature of the hazard.

The environmental studies have been designed to determine the maximum, minimum, and average pollution as influenced by meteorological and other factors over a sufficiently long period, and to evaluate their effects on health, economy, safety, and vegetation.

Obviously, such studies call for continuous observation and sampling techniques on an area basis. No adequate knowledge of diurnal variation, and of weekly, monthly, and yearly cycles of pollution can be obtained other than by the continuous sampling technique. A comprehensive picture of pollution is difficult to achieve by intermittent sampling methods. Meteorological factors, which cause great variations in pollution, are operative throughout the 24-hour day and fluctuate with the seasons. Environmental evaluations must be approached on this basis.

Sulfur Dioxide Pollution

The rise and fall of the level of sulfur dioxide in the air has been chosen as an index of gaseous pollution since the gas is one of the major contaminants in quantity in the area. Four con-

tinuous-test stations have been in operation in the Greater Windsor area where Thomas autometers have been located at three stations in the more heavily contaminated portion.

In view of the high persistence of winds from the north, northwest, west, and southwest directions, the sulfur dioxide observations at these stations are influenced by effluents from sources on both sides of the international boundary. The mean concentration at each autometer station has been calculated for every 30-minute period of the day. Peak concentrations over shorter time intervals have also been evaluated whenever such peaks have indicated unusual fluctuations in concentration. A comparison of the monthly means for 1951 indicates the existence of two seasonal peaks in the pollution load, occurring in the spring months of April and May, and in the late fall and early winter period.

The pollution load, as indicated by variations in intensity and frequency of sulfur dioxide fumigations, shows marked seasonal as well as diurnal trends.

Smog visitations of several days' duration have been noted during temperature inversion periods in the area. Highest frequency of occurrence was April, May, and July and from October to December. Relatively high peak concentrations of sulfur dioxide have been noted during such visitations.

In the light of what is known of pollution in other industrial areas, such peak concentrations, as well as the mean values, indicate more serious sulfur dioxide conditions in the Detroit River area than in such polluted zones as Los Angeles, Yonkers, N. Y., some of the industrial regions of Great Britain, and even the Trail, B. C., area, before the full employment of remedial measures. The possibility of a major disaster in the Detroit River area is rendered unlikely only on the grounds of its topography, but, with increasing industrialization, toxic levels of pollution are being built up to serious proportions.

Distribution of Suspended Particulate Matter

The zones of high, medium, and low pollution with reference to aerosol concentrations have been investigated by continuous high volume filtration units set up at 30 stations on the United States side and 25 on the Canadian side of the boundary. These units sample the air at a rate of about 50 cubic feet per minute, and collect the aerosol contaminants on specially prepared pleated paper filters, which are changed every 24 hours. High concentrations of particulate matter usually coincide with periods of smog and relatively heavy sulfur dioxide fumigations.

Delineation of areas of heavy, moderate, and low pollution has been attempted on the basis of the mean and maximum concentrations of particulate contaminants from the continuous filtration data. In general, the most heavily polluted areas on the Canadian side lie close to the river. The areas of heavy pollution also lie within the zones which contain the major industrial operations. The areas of moderate to low pollution are located to the east and south of Windsor, with the lowest values of all shown by the sampling stations located at Tecumseh and McGregor, Ont. There is about a threefold increase in mean concentration of particulate matter between the lowest and the most heavily polluted areas.

Distribution of Deposited Matter

The distribution of deposited matter, or dustfall, has been studied by analyses of data from 20 sampling sites in the greater Windsor area. In the heavily polluted area, the mean dustfall for all stations is about 92 tons per square mile per month. In the heavy to moderate pollution area, the mean dustfall is 53.9 tons per square mile per month, whereas in the moderate to low pollution zones the mean dustfall ranges from 42.7 to 35.9 tons per square mile per month. Here, as in the case of the suspended particulate matter, there is also a threefold increase in the pollution load in passing from the low to the heavily contaminated areas.

The average monthly dustfall pollution in the heavily contaminated area of Windsor is apparently greater than that reported recently for Chicago, Cincinnati, and Los Angeles, for Toronto, Canada, and for Pittsburgh.

There is a considerable difference in the composition of deposited matter and suspended matter in coal-burning areas. Particles which remain suspended in city air may consist of 85 percent by weight of tar and combustible or-

ganic matter, and only about 15 percent of ash, whereas deposited matter may contain upwards of 70 percent ash.

Nature of Suspended Particulate Matter

The chemical nature of the inorganic components of the complex aerosols in this environment has been studied by methods of X-ray diffraction and by spectrographic analysis. About 20 metallic elements have been identified in varying amounts. The most abundant are calcium, silicon, aluminum, and iron.

Public Health and Welfare

The air pollution disasters of the Meuse valley in Belgium and at Donora, Pa., have shown conclusively that unrestricted and excessive contamination of the atmosphere under adverse meteorological and topographical conditions may lead to acute episodes involving sickness and death from respiratory and cardiovascular disorders. The chronic effects of air pollution are not so clearly defined; nevertheless, the frequent occurrence of eye irritation and the smog damage to vegetation in the Los Angeles area during temperature inversions illustrate that such influences are also present. The Donora report has stressed the significance of a synergistic effect in air pollution so that the combined influence of a number of toxic contaminants occurring simultaneously may be far greater than the additive effect of individual contaminants. The specific surface and adsorptive capacity of small aerosol particles for gases and vapors, the role of condensation nuclei, and the deposition of sulfuric acid mist and other compounds on such nuclei may affect the respiratory system in a manner entirely different from that of similar concentrations and durations of relatively pure toxicants.

Statistics and correlations on the increased deaths from respiratory disease during smog visitations in English industrial communities have been reported. The loss of sunshine and decrease in ultraviolet irradiation have been considered as contributing factors in the occurrence of deficiency diseases such as rickets. There is, as yet, little experimental work available on the effect of air pollutants on the health of humans and animals in the concentrations and under the environmental conditions approaching those of the atmosphere of cities and industrial areas. It was the consensus at the conclusion of the United States Technical Conference on Air Pollution of May 1950 that pollution with allergenic material of industrial origin is associated with a frequent and apparently increasing occurrence of acute and chronic disease, involving especially the respiratory tract and the skin.

Although there may be some disagreement among authorities as to the magnitude of the chronic effects of excessive air pollution on public health, nobody will deny the existence of adverse effects on public welfare. Huge economic losses have been sustained in city areas from the accelerated deterioration of buildings, structural materials, corrosion of metals, plant and household equipment, injuries to textiles and other fabrics, and excessive laundry bills. The frequent occurrence of smog in densely populated areas, accompanied by poor visibility, has caused serious and costly traffic dislocation at airports and on highways. In rural areas, gas damage may result in retardation and killing of crop plants and forest growth, and erosion and poisoning of soils.

Industry's Part In the Study

PHR brief

It was expected that the information supplied, when evaluated, would give a fair picture of the combustion processes in the Detroit-Windsor area, and, at the same time, give a general idea of the degree of control now in effect. In addition, the evaluation should pinpoint a large portion of the potential sulfur sources.

Survey of Pollution Sources

The second major field of investigation was one which could become never-ending. It was covered by the request on the questionnaire that

By J. C. Radcliffe, M.Sc., supervisor, industrial health unit, Ford Motor Company, Dearborn, Mich.

"Companies operating plants which emit gases and solids into the atmosphere, other than ordinary products of combustion and fly ash, are to answer the following: (*a*) type of process; (*b*) list raw material used; (*c*) list finished products and approximate annual output; (*d*) nature of effluents; (*e*) height at which discharged; (*f*) methods adopted for reducing amount of this effluent."

A section for additional remarks was included, which undoubtedly was not wholly completed by many industries. Industry would be in an extremely enviable position if it had the answers to these questions. As it is, many industries have a long way to go in this direction, and the questionnaire results revealed an obvious lack of final data.

Coordination

It was indicated that the official agencies could perform some stack sampling along with type sampling in their areas. It was further indicated that the official agencies desired industry's cooperation wherever possible in a representative stack sampling program.

Thus, a separate technical committee was established through which official agencies and industry would coordinate techniques and sampling methods.

The next step was to develop agreement on the techniques and methods to be used in stack sampling. Various standard methods proposed by the American Society of Mechanical Engineers and other groups were reviewed. General rules were adopted on locating sampling points, measuring temperatures of stack gases, types of sampling equipment recommended, and types of materials to be analyzed.

Many representatives from industry were sent to the noncredit training lectures set up in 1951 with the University of Michigan extension service for instruction in the methods to be used in analyzing effluents from various stacks in the area. They have since begun their respective stack evaluations.

Stack Sampling

We have now passed beyond the initial mapping or planning stage. At present, most of the plants are approaching or are already in the sampling, evaluation, or correction phase of the industrial study. We have reached the point of agreement on the order in which the stacks should be sampled. Normally, those operations which are thought to be prime contributors from a visual viewpoint are put first, and minor ones last.

In order to insure a common sampling procedure, most industries plan to have similar-sized holes put in all stacks so as to require only one basic type of sampling probe. Industrial planning and engineering departments are being contacted so that any new process exhaust stacks can be fitted in their design stages with the standard hole for stack sampling.

Care is being taken in the sampling program to note variations due to time of day, week, and point in the process. Sufficient grab samples (10 minutes to 1 hour) are obtained to determine maximum, minimum, and average conditions. In some instances, as on powerhouse stacks, it is necessary to obtain samples during both winter and summer.

The results we are getting are interpreted to indicate the degree of air pollution. Where high results are obtained, further corrective action is indicated.

From an industrial viewpoint, the most promising aspect of the entire industrial study of factors contributing to air pollution is not primarily the correction of existing conditions but it is the designing and building of control devices to be incorporated into each new operation in the future. This type of control, planned before the foundation is laid for a building, in time will be of prime importance in controlling air pollution.

An invitation was extended to industry in the Detroit-Windsor area to discuss the proposed air pollution study to be conducted in that area. The meeting, held in September 1950, was attended by approximately 50 representatives of industry and technical personnel from official agencies.

As a start, industry's cooperation was requested in two major fields: the first, a survey of fuel and fuel-burning equipment used throughout the area; and the second, an inquiry into the sources of gases and solids discharged into the atmosphere in the area. To obtain the information it was decided that a questionnaire would be circulated to industrial plants.

Combustion Processes

For the first of the two major fields, questions were asked about the kinds of fuel burned (coal, coke, oil, gas, garbage, trash, and other); amount of fuel burned in 1949; type of fuel-burning equipment (hand-fired, underfeed stoker, spreader stoker, pulverized fuel, traveling grates); and the number and height of smokestacks.

Additional information was requested on auxiliary equipment, methods or operating procedures for reducing smoke or fly ash emission, and smoke indicators in use. Where coal or coke was used, questions were asked on the size, volatility, amount of ash and sulfur in percentage by weight on a dry basis; for oil, the percentage of weight of sulfur; and for gas, the percentage by volume of sulfur.

Environmental Studies—Meteorological Aspects

PHR brief

Although the environmental study of air pollution in the Detroit-Windsor area was begun nearly 2 years ago, the weather study is only in the organizational stage at this time.

The meteorological investigation will be an international undertaking with direct cooperation between the two national weather services. In addition, the weather facilities of the United States Air Force and the United States Navy, plus all available weather data from municipal and private sources, will be coordinated in the study.

It is evident that gaseous and particulate contaminants resulting from combustion and other industrial processes are continuously being released into the atmosphere. Because it is left to the atmosphere to rid us of these contaminants, it is common to speak of our aerial sewage system.

By Harold W. Baynton, B.A., research meteorologist, Meteorological Service of Canada

The atmosphere usually does its job well, but occasionally it loses its ability to carry off and disperse contaminants. It is obvious to everyone, for example, that the system has broken down when dense smoke and fog hang over the city, as they so often do early in the morning.

The meteorological study in the Detroit-Windsor area will be aimed at determining and evaluating the meteorological factors that control this property of the atmosphere to remove and disperse contaminants. It will be a study of the diffusing power of the atmosphere.

Weather and Air Pollution

At the present state of knowledge of air pollution, the position of weather has been summarized in the meteorological panel report issued in 1951 by the United States Technical Conference on Air Pollution:

"The average distribution of contaminants in a city is governed by wind, rain, atmospheric stability, and topographic features. The contaminants in their turn influence rainfall and fog occurrence and persistence."

In any metropolitan area, these elements of weather are always at work, tending to shift the regions of maximum pollution, to confine the pollution to relatively small volumes of air, or to disperse it rapidly through great volumes of air. We become fully alerted to the importance of weather in a study of air pollution when we realize that it was the development and persistence of special meteorological conditions that contributed to the disasters in the Meuse valley and, more recently, at Donora.

A meteorological study aimed at throwing light on the processes of air pollution will be primarily a study of winds, atmospheric stability, and precipitation. Each of these three major areas of investigation can be broken down in a number of ways. Winds can be analyzed from the standpoints of prevailing direction, frequency of calms, frequency of certain speeds, gustiness, diurnal and seasonal variations, and other factors. Stability can be analyzed directly from radiosonde data or other instrumental measurements of temperatures aloft, and indirectly from studies of surface temperatures, hours of sunshine, visibility, and frequency of fog.

Observation Network

In a scientific study of any kind, it is desirable to have more than one measurement of, and more than one method of measuring the quantities under consideration. To study the meteorological aspects of air pollution, it is useful to have a close network of observing stations throughout the area. It is then possible to study the micrometeorology of the area.

The Detroit-Windsor area is already well equipped from this standpoint. There are 23 stations in or near the area taking complete or partial observations. Many of the stations are operated by industry. From this network, there are available 9 measurements of surface wind, 12 measurements of surface temperature, 6 measurements of visibility, 7 measurements of atmospheric pressure, to mention a few, and single measurements of temperatures and winds aloft and hours of sunshine. It is planned to supplement the existing network with a few special installations. Before incorporating all the available data in a study of the micrometeorology of the area, observation procedures must be standardized. Otherwise, the various measurements would not be directly comparable.

Geographic Factors

It is interesting to speculate on the likelihood of an air pollution disaster in the Detroit-Windsor area. The two most notorious disasters (the Meuse valley, Belgium, and Donora, Pa.) both occurred in valleys. Valley walls create a natural vessel for pollution, inhibiting lateral diffusion. A valley creates a favorable environment for the development of an inversion which, in turn, serves to put a lid over the pollution and damp out vertical diffusion. The final meteorological condition for a disastrous fumigation seems to be the stagnation of a center of high pressure over the region, allowing the inversion to persist and intensify.

Records of the United States Weather Bureau reveal that for the Great Lakes area, summer is the favored time for air stagnation of high-pressure centers. This is also the season of maximum solar radiation, maximum instability, and, therefore, minimum frequency of inversions. In the case of Donora, it was found that anticyclones over the area were most common in October. October is also a month with relatively long nights, which are favorable for the formation of early morning inversion.

Therefore, from purely meteorological and geographic considerations, conditions favorable for a disastrous smog are less probable in the Detroit-Windsor area than in the Donora area. On the other hand, the tremendous concentration of industry in the area, and the unusually heavy steamboat traffic on the Detroit River are highly favorable for the occurrence of disastrous concentrations.

It is hoped that the meteorological study will reveal what conditions are prerequisites in this area for a disastrous smog, and what are the probabilities of its occurrence.

Environmental Studies—Health Aspects

PHR brief

An investigation which will yield a valid answer to "What effect does air pollution have on health?" is difficult to plan. Concurrently, answers to three other pertinent questions must be obtained as well:

What constitutes normal health in the affected population?

What are the criteria for impaired health?

What factors other than man-made air pollution adversely influence health?

Factors Influencing Health

The health of population groups is intimately related to numerous environmental and socioeconomic factors. Among the more influential of the latter are income, nutrition, medical care, race, family health and sanitation practices, and age of the population groups which are selected for study. Significant environmental

By Joseph G. Molner, M.D., health commissioner, and William G. Frederick, Ph.D., director, bureau of industrial hygiene, Detroit Department of Health.

factors include such aspects of housing as sanitation, overcrowding, physical recreation facilities and heating, man-made air contaminants, airborne disease-producing micro-organisms, pollens and other naturally occurring allergins, occupational exposures injurious to health, and weather. Also important is community sanitation—food, water, and insect and rodent control.

Once determined, socioeconomic influence in a given area remains fairly constant over a period of time. The ambient factors, such as man-made air contaminants, air bacteria, pollens, and weather must be measured accurately and continuously over the entire study period.

The collection of information on weather and on air contaminants is another phase of the air pollution study, but the data are collected so as to be directly applicable to the health study.

Preliminary Area Studies

It was apparent that a complex study of this nature involving a very large population group would have to be conducted according to sound statistical procedure. Samples of the area and population would have to be so selected that accumulated data could be treated by valid statistical analysis. Planning of the study was placed under the supervision of statisticians who would be responsible for the eventual analysis of the data. Under their direction, a thorough investigation was made to determine if satisfactory sample areas could be established with significant differences in respect to the several measurable environmental factors. In the Detroit-Windsor community it was possible to select a number of comparable sites for study. Examples are: high, medium, and low racial income groups in low and high pollution areas; low income racial groups occupying both poor and good housing. We feel that in the study of these groups informed consideration can be given to the significant social and economic factors of income, nutrition, medical care, race, age, and family sanitation practice.

The Pilot Health Study

The conduct of a comparative health study is extremely complex, tedious, and expensive. No prototype is available for guidance. The Technical Advisory Board on Air Pollution of the International Joint Commission set up a subcommittee to plan the technical details of the study. The committee concluded that only a general plan could be evolved prior to actual field work. It was decided to develop the procedure for the general health study from a pilot study.

Organization of Community Resources

A successful health study is completely dependent upon the interest, cooperation, and support of the community. Medical and health agencies, industry, government, social agencies, the press, and the citizens must be made aware that a study is in progress. They must be convinced of its value before they will actively participate in or support it. To bring this about, a health advisory committee has been established for the Detroit-Windsor air pollution study. It is a large committee in which all phases of community life and institutions are represented.

Family Health Evaluation Techniques

The only direct method for establishing the comparative health status of population groups in the health study is through direct interview with a sufficient sample of family groups. Pairs of contrasting areas are being considered for study purposes. A sample of families in each area will be visited by a trained interviewer. At the first visit to the family the objectives of the study will be outlined and a fairly complete family history will be undertaken. Subsequent visits will be made monthly during the study to obtain detailed information on the family's health experience during the preceding month. The early phase of this work will primarily test sampling technique, forms, methods, and the response of cooperating families. During the latter phase, useful data will be collected which can be intercompared and evaluated by statistical methods.

Utilization of Existing Data

A substantial volume of pertinent health data is already being collected. The Detroit Health Department has excellent data on the geographic incidence of such diseases as tuberculosis, cancer, and pneumonia which may be

very informative if reconciled with the health area of this study. We have found that daily reports of sickness absenteeism from the medical departments of selected industries and the daily demand for substitute teachers in the public school system are useful indicators of sickness in the community. The records of physicians in selected areas of practice, allergists for example, may be especially pertinent. The city of Windsor has been conducting a general health study for some time among its residents.

Implementation of the Pilot Study

Even a pilot study of very limited scope is a time-consuming and expensive undertaking, apart from the collection of essential concurrent air pollution data. A pooling of contributions in staff and funds from the health services of the national governments, State, Provincial, and local health departments, research foundations, and community industry is necessary.

The conduct of a valid inquiry into the effect of air pollution on health is a formidable undertaking, requiring integration with concurrent environmental studies and consideration of socioeconomic factors. It must be a total study of the health status of the people of the community. It is hoped that the effect of several environmental and social factors on health will be determined at the same time. It is this hope that justifies the tremendous effort and expense the health study involves.

PHR

Clearinghouse on Morbidity Statistics Projects

A clearinghouse for current studies and surveys of morbidity has recently been established under the auspices of the Public Health Conference on Records and Statistics. The purpose of the clearinghouse is to help public health and medical workers locate specific data on diseases, injuries, and impairments, and to permit those who are planning new projects involving the measurement of illness to contact others who have undertaken similar tasks.

At regular intervals the clearinghouse will conduct a canvass of studies or surveys in progress. Lists of new projects to be released from time to time will contain brief outlines of the methods used and data to be collected. No information will be published, however, without the permission of those responsible for the project.

Inquiries about the clearinghouse may be directed to: Clearinghouse on Current Morbidity Statistics Projects, care of Division of Public Health Methods, Public Health Service, Federal Security Agency, Washington 25, D. C.

Ideas

Have You an Idea?

Do you feel your ideas are too old? Perhaps. But those you have tested through the years may be new outside of your health community—and may be just what someone else needs. Share your ideas. Write us, and we will try to help.

—THE EDITORS

Operation Knoxville

TENNESSEE. Operation Knoxville is the first campaign of its kind to unite the entire resources of a community in seeking out, rehabilitating, and placing in employment the handicapped citizens of a locality.

Knox County, Tenn., where the rehabilitation campaign was launched last February, has some 1,500 known handicapped persons. If at least one-half of this group could be rehabilitated for employment, an estimated 250 families and 700 children would be removed from the public assistance rolls, thereby reducing municipal expenses far beyond the cost of rehabilitation.

Operation Knoxville was initially proposed by the Tennessee State director of vocational rehabilitation, who called an informal meeting of community leaders to discuss plans for rehabilitating the local handicapped population. Local residents and Federal consultants worked out a team approach for the screening and evaluation of rehabilitation cases. Committees were formed of industrial leaders, personnel directors, and representatives from labor unions, medical societies, vocational schools, and other educational facilities.

The Knoxville project has been successful—so much so that in Washington the Office of Defense Mobilization has worked with the Office of Vocational Rehabilitation of the Federal Security Agency to develop and distribute informational materials about the project for use in radio addresses and public forums throughout the country. These materials have been sent to all State rehabilitation agencies.

Fountain Phi Betes

COLORADO. Courses designed especially for soda-fountain personnel are a special service open to all Colorado communities by the food-service and sanitation program of the State board for vocational education.

Two short courses are offered, each consisting of four 2-hour sessions. One is open only to experienced, employed personnel, and the other is for high school students working part-time at fountains.

Soda fountain dispensers are no longer called soda fountain "jerks"—this change-over to a self-respecting job designation is one of the early principles taught to the students of the courses.

Specific instruction covers: work routines, dispensing techniques, fountain formulas, tips on sandwich making, proper handling of eating utensils, methods of cleaning and using all fountain equipment, and when and how to use single service utensils.

Part-Time Teachers

ARIZONA. A plan for utilizing services of teachers on a part-time basis in expanding community health services is being put into action here. Elementary teachers with specialized training in health and physical education will disseminate, in their own localities, the latest information on public health to schools and various professional and service groups interested in better health programs. The plan was developed by the State Health Department in cooperation with Arizona State College at Tempe.

Laboratory Aid

BETHESDA, MD. Are you breaking or etching glass pipettes against the rims of glass jars in which they are placed in a disinfecting solution?

Try using a one-fourth-inch bore rubber tubing, which is standard equipment in any laboratory. Split it lengthwise, and cut it to fit around the jar rim. This effective protection against breakage and contamination was devised by a young medical biology technician, Walter S. Hunter, at the National Institutes of Health of the Public Health Service.

Needle Tubes

BROOKLYN, N. Y. Any laboratory can make its own sterilizing tubes for needles, thereby avoiding dulled needles and saving money, according to the Public Health Service Hospital at Manhattan Beach.

Take an ordinary test tube—this is an ideal way to use old, scratched, and etched tubes. Heat it sufficiently to indent a portion where a needle can be suspended. Judge the size of the test tube needed by the size and length of the needle—for a 1½-inch needle, a 120 x 13 mm. test tube is suggested.

Previously, the hospital laboratory used as a holder a test tube plugged with cotton in which the needle rested. But cotton fibers could be drawn into the blood stream by lodging within the hollow of the needle. To avoid this possibility, the problem of suspending the needle in a tube was presented to Ernest Battle, a medical technician in the laboratory. The result is not a new idea—there is a commercial tube available for approximately 25 cents.

The laboratory not only prepares its own supply of needle holders, keeping about 100 sterilized needles on hand at a time—it also maintains a stock of the tubes in the central supply room of the hospital.

Activities of Health Officers *in* Local Health Departments

By MARION FERGUSON, Ph.D., HARALD M. GRANING, M.D., M.P.H., and BESS A. CHENEY, M.A.

In his typical work week, the local health officer spends 2,538 minutes for 74 activity occurrences in 12 different health programs. Seventy-five percent of this average, or 1,896 minutes, involves medical judgment.

These figures are derived from information supplied by 186 physicians serving as health officers in local health departments throughout the United States, in a study undertaken to obtain information on the utilization of medical manpower in the public health field.

Critical shortages of manpower exist in public health—a field for which the preparation of professional workers requires a long time and in which the number of such workers is limited. The prospects are that the demands of civilian defense, the needs of the military services, and those of the Point IV technical assistance program will further accentuate this shortage. Consideration of these factors made it worth while to ascertain, if possible, the programs and activities of physicians employed as local health officers and to learn something about the extent to which they felt they used medical judgment in performing those duties.

The techniques of activity analysis and time study have been used successfully in the field of public health for investigations into the work of various types of personnel, though only a few studies have been reported for health officers. In 1933, Charters (*1*) studied the duties of Ohio public health commissioners to provide the basis for the curriculum of a physician-training program. Dean (*2*), in 1935, analyzed the job of a rural health officer as one of the Brunswick-Greensville Health Administration Studies. Included was a distribution of the time of the health officer for a 10-month period.

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A report on "Activities of Medical Administrators in State Health Departments," appeared in Public Health Reports, May 18, 1951, pp. 619–629.

Plan and Participation

The present study was planned to collect information concerning the range and frequency of activities of full-time health officers in local health departments serving jurisdictions of 50,000 to 500,000 populations within the continental United States.

Reports were received from 186 health officers, 51 percent of the 365 known to be employed on a full-time basis in all types of local health departments serving areas with such populations

(*3*). Health officers in 35 States participated in the study.

Length of Work Week

One hundred and six health officers reported a 5½-day week, 66 reported a 5-day week, 9 reported a 6-day week, and 4 reported some time on the seventh day. One participant became ill and reported only 3 days.

The length of the work day, Monday through Friday, ranged from 4 to 16 hours, with a median of 8 hours. The median time on Saturday was 4 hours.

Eighty-five of the respondents reported a work week of 40 to 48 hours, while 46 reported between 36 and 40 hours, and 21 between 48 and 52 hours. Twenty-five reported less than 36 hours, 8 reported between 52 and 60 hours, and one, serving a large local district, reported 77 hours.

The average length of work week for actual time reported was 42 hours and 18 minutes. Very little variation occurred in the average when the length of the working time was computed by size of population served, or by type of department.

Programs

A total time of 472,045 minutes was reported by the 186 local health officers for activities performed during the period of the study. This represented 13,749 occurrences of those activities, or a mean time of 34 minutes per occurrence.

The material reported was grouped into 20 types of programs. Nineteen of these were categorical and one, general, related to more than one program or to over-all administration. This group accounted for 39 percent of all time reported, and the first 10 programs accounted for 86 percent of the total time reported.

Program	*Number occurrences*	*Number minutes*	*Percent time*	*Rank*
All	13, 749	472, 045	100. 0	
General	4, 932	184, 650	39. 1	1
Sanitation	1, 895	54, 025	11. 4	2
Communicable disease	1, 233	34, 515	7. 3	3
Tuberculosis	870	30, 240	6. 4	4
School	656	24, 265	5. 1	5
Venereal disease	661	21, 280	4. 5	6
Medical care	540	17, 705	3. 8	7
Infant and preschool	342	14, 905	3. 2	8
Mental hygiene	373	13, 125	2. 8	9
Crippled children	300	10, 970	2. 3	10
Chronic disease	254	8, 590	1. 8	11
Hospital facilities	194	8, 140	1. 7	12
Dental	246	7, 800	1. 7	13
Maternity	188	6, 920	1. 5	14
Public health statistics	254	6, 475	1. 4	15
Cancer	156	5, 400	1. 2	16
Laboratory	219	4, 925	1. 0	17
Disaster and emergencies	102	4, 535	1. 0	18
Training	41	3, 945	. 8	19
Industrial hygiene	73	2, 270	. 5	20
Personal and unidentified [1]	242	7, 365	1. 5	

[1] Only 25 of the 13,749 entries, accounting for 1,025 minutes, could not be identified, an insignificant fraction of the time included in the study.

When the individual programs were arrayed in descending order according to the amount of time reported, there was a consistency in the relative rank of most of them, whether they were considered by size of population served, by type of department, by geographic location, or by season. Over-all administrative problems, as reported under general, ranked first on all the distributions. Sanitation was second in all but local and State district health departments. Although the other programs were not as consistent, with but few

exceptions they tended to cluster within a comparatively narrow range. Medical care ranked from fourth to tenth place in the 20 possible distributions.

Activities

Activities reported were grouped under 26 headings. The first five activities represented 45 percent of the total time. The inclusion of the next five activities raised this to 70 percent.

When the activities were grouped by size of population, type of department, season, and geographic area and were arrayed in descending order according to the amount of time reported, none of them was consistently in first place. Clinic participation ranked first in 10 of 20 distributions, although it ranked second in total time. Individual conferences, first in total time, also ranked first in 6 distributions and ranged from second to fifth in the remaining 13.

Activity	*Number of occurrences*	*Number of minutes*	*Percent of time*	*Rank*
All	13, 749	472, 045	100. 0	
Conferences, individual	1, 909	48, 505	10. 3	1
Clinic participation	716	48, 160	10. 2	2
Correspondence	1, 343	40, 505	8. 6	3
Conferences, group	655	40, 010	8. 5	4
Travel	1, 092	36, 150	7. 6	5
Program planning	754	30, 345	6. 4	6
Direction and supervision	943	28, 305	6. 0	7
Records and reports	651	20, 115	4. 3	8
Meetings attended	202	19, 715	4. 2	9
Telephone	1, 832	18, 200	3. 8	10
Field investigation	273	15, 255	3. 2	11
Board participation	173	15, 020	3. 2	12
Community activity	269	12, 455	2. 6	13
Self-improvement—reading, etc	319	11, 945	2. 5	14
Budget and fiscal	324	10, 175	2. 2	15
Preparation of educational material	216	9, 530	2. 0	16
Personnel	329	8, 605	1. 8	17
Enforcement of ordinances	251	8, 355	1. 8	18
Licensing and permits	313	7, 320	1. 6	19
Professional consultation services	261	6, 805	1. 4	20
Evaluations and surveys	166	6, 445	1. 4	21
Talks given	94	5, 800	1. 2	22
Teaching	69	5, 015	1. 1	23
Education-in-service	94	4, 980	1. 1	24
Housekeeping and errands	116	3, 565	. 8	25
Purchasing	144	3, 400	. 7	26
Personal and unidentified	242	7, 365	1. 5	

For both programs and activities, the greatest variations from the array of the total time were found in the health departments which served the largest population, in State district health departments, and in the Great Plains and Rocky Mountain regions.

Relation of Activity to Program

No consistent pattern emerged in relating activities to programs. Only individual conferences and clinic participation represented as much as 10 percent of the total time. Direction and supervision required 6 percent of the total time, varying from less than 1 percent in the cancer program to 19 percent in laboratory. About 2 percent of all time reported was listed for personnel, ranging from none in three programs—crippled children, industrial hygiene, disaster and emergency—to 6 percent in laboratory. Sixty-four percent of all time devoted to personnel was reported in the general program, but this activity represented only 3 percent of the general program time.

Program planning had an important place in the chronic disease and laboratory programs where it required 12 percent of the time for each, and in the dental program with 18 per-

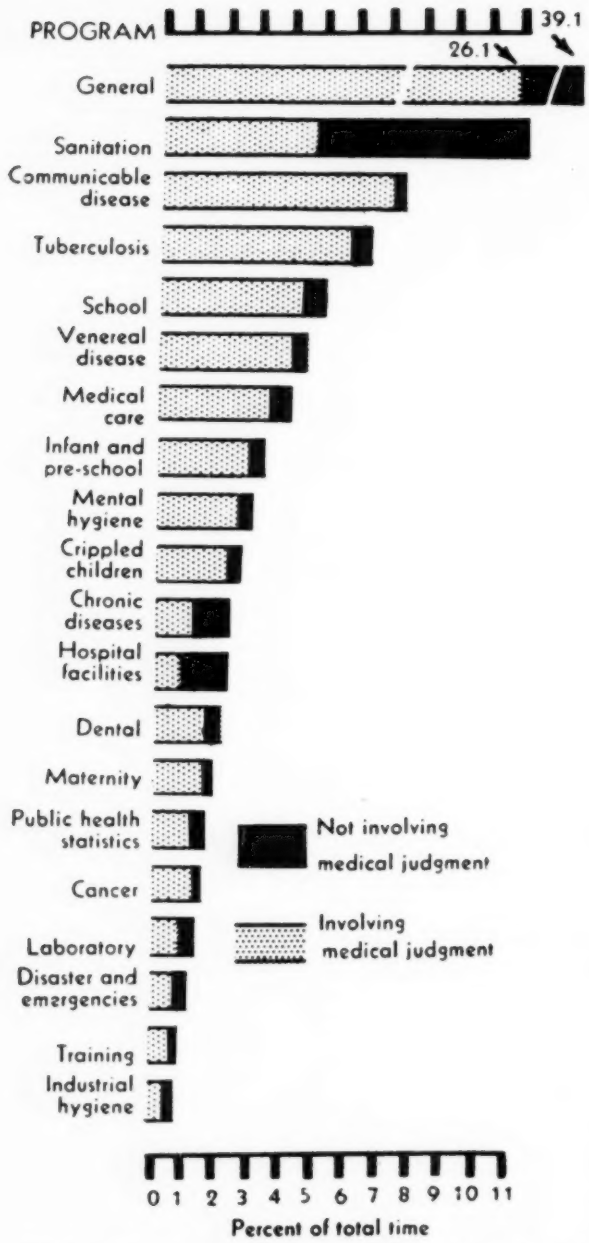

Figure 1. Percent distribution by *program* of total time and of total time involving medical judgment reported by 186 local health officers for one week in 1950.

cent. However, all programs except training reported some time in this activity. Eighty-three percent of all time spent on budget and fiscal matters was allocated to the general program, representing 5 percent of the time in that program. In most of the specialized programs, little or no time was reported for this activity. Licensing and permits, with which was included authorization or commitment for hospital or other care, took 14 percent of the time reported in the mental hygiene program, 5 percent in medical care, 4 percent in tuberculosis, but was unimportant in all the other programs. The general program included 93 percent of all time for correspondence, which represented 20 percent of the total time in that program. The remainder of the time for correspondence was scattered through the categorical programs in very small units.

The only program including a considerable amount of time for records and reports was public health statistics, in which this activity represented 26 percent of the time. Meetings attended represented only 4 percent of the total time, but it was an important activity in the cancer program, requiring 29 percent of the time. It also accounted for 10 percent of the time in the industrial hygiene program, 11 percent each in medical care and in training, 13 percent in chronic diseases, and 16 percent in the disaster and emergencies program.

Individual conferences, which represented the greatest amount of time for a single activity, ranged from 1 percent in the training program to 21 percent in sanitation. It made up 12 percent of time reported for medical care. Group conferences also took a good deal of time, from 2 percent in the venereal disease program to 22 percent in the dental and training programs. Field investigations were important activities only in communicable disease and in sanitation, where they represented 11 percent of the time, and in industrial hygiene, 17 percent. Evaluations and surveys accounted for 19 percent of the time in the public health statistics program but elsewhere required little time.

In eight categorical programs, clinic participation represented the highest percent of time, with more than 40 percent reported in infant and preschool, venereal disease, and maternity. Little time was reported for this activity elsewhere. Professional consultation appeared in an appreciable amount only in the communicable disease program, where it represented 9 percent of the time.

Medical Judgment

Of the 472,045 minutes accounted for by local health officers in this study, 352,575, or 75 per-

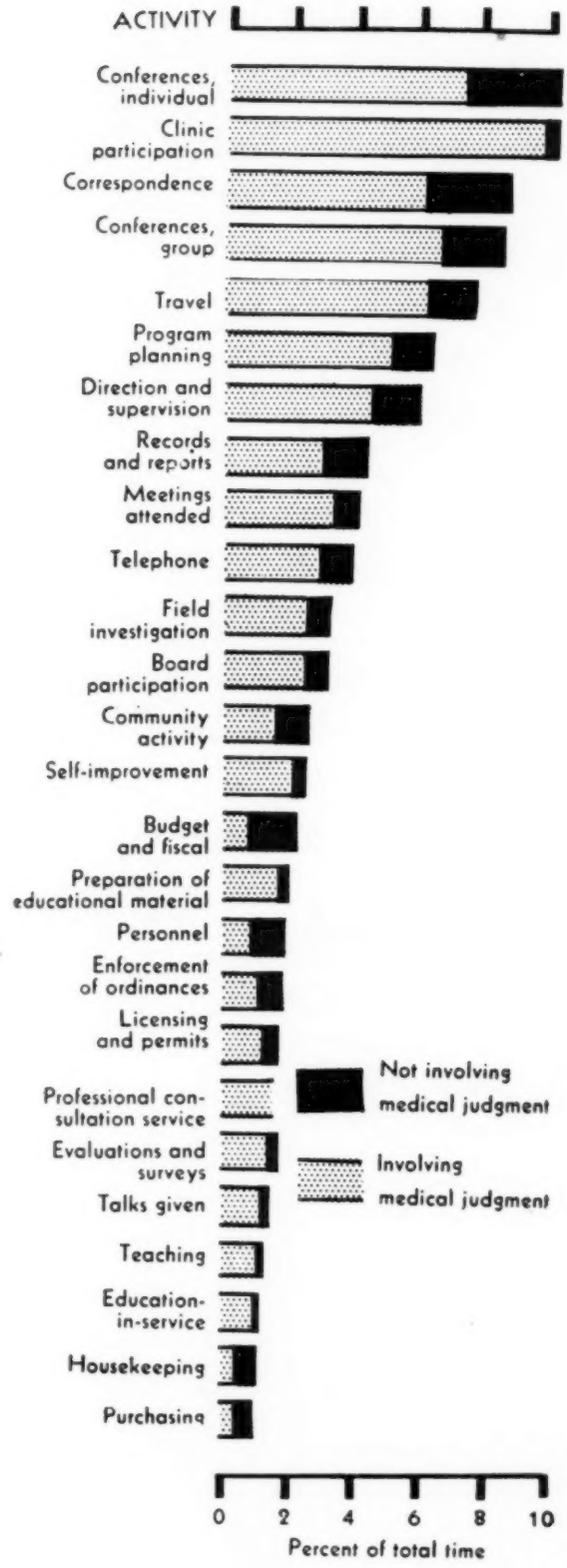

Figure 2. Percent distribution by *activity* of total time and of total time involving medical judgment reported by 186 local health officers for one week in 1950.

cent, were reported as spent in the performance of duties that in the opinion of the respondents involved medical judgment; 116,060, or 24 percent, were for duties that did not involve such judgment. No decision was indicated for the remaining 3,410 minutes, slightly less than 1 percent.

The mean time of 34 minutes per occurrence increased to 37 minutes when medical judgment was involved and decreased to 28 minutes when it was not involved.

No definition of medical judgment was attempted in preparing instructions for use in recording activities. It was believed that each health officer could best determine from his own professional background and his own evaluation of his activities which of his individual actions involved medical judgment.

The percent of time which involved medical judgment as reported by individual respondents ranged from 100 to 12 percent. Five of the 186 health officers reported that all their time involved medical judgment. One health officer indicated only 12 percent of the time he reported involved medical judgment. The median percent of time in which medical judgment was involved was 76. The middle 50 percent of the health officers reported that medical judgment was involved in their activities from 65 to 88 percent of the time.

Health officers in areas of 50,000 to 99,999 reported the highest percent (78) of time involving medical judgment. This decreased to 73 percent for the middle population group and to a low of 62 percent for the areas of 250,000 to 500,000. Apparently the volume of nonmedical administrative duties increased as the size of population in the area served increased.

The percent of time involving medical judgment (74 to 76) reported during each study period was quite consistent. The demands on the medical skills of the health officers seemed to be year-round demands rather than seasonal.

The amount of time reported as involving medical judgment varied with the type of department. The percent (68) of such time was somewhat lower for city-county units than for all types of departments as a whole, while it was slightly higher for local health districts (82 percent) and State districts (81 percent). The lower percent in the city-county units

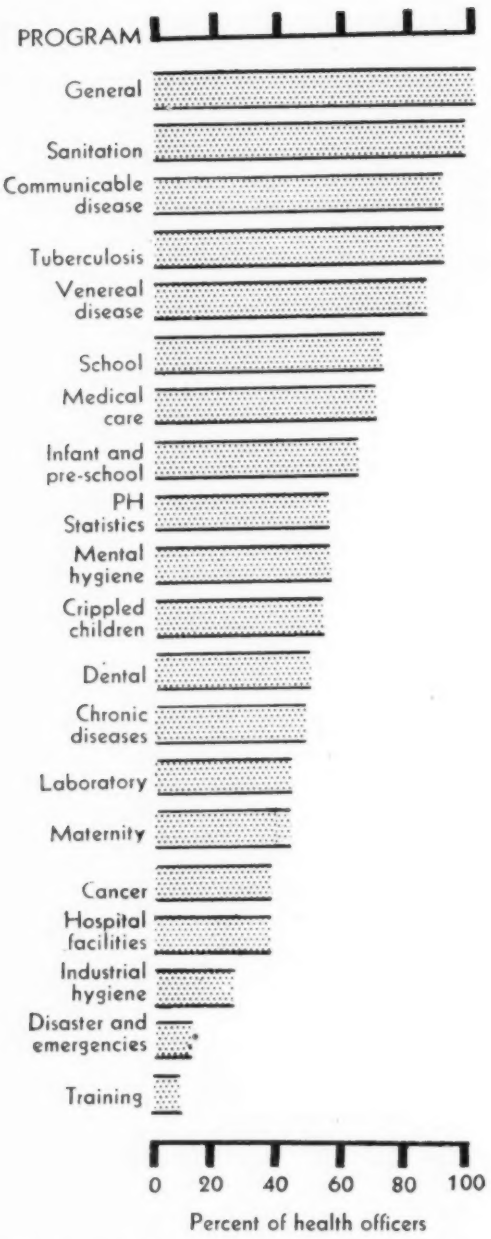

Figure 3. Percent of local health officers participating in each program.

might be explained by the more complex nonmedical administrative duties, although the difference was not great enough to be significant.

When the geographic location of the health department was considered, the percent of time reported as involving medical judgment did not vary appreciably among Federal Security Agency regions except for Region VII. The 55 percent reported for this area was considerably below the range of from 69 to 78 percent reported for the rest of the country. In this region, the health departments reporting were city, city-county, and county departments and were in areas of 100,000 to 249,999 population.

For the various programs, the time reported as involving medical judgment ranged from 94 to 48 percent (fig. 1). Those in which 94 to 90 percent of the time was so reported were venereal disease, communicable disease, maternity, infant and preschool, tuberculosis, cancer, mental hygiene, and medical care. The smallest percents of time (70 to 48) were reported for the dental, public health statistics, general, industrial hygiene, and sanitation programs.

The amount of time reported as involving medical judgment varied considerably for the different activities (fig. 2). Clinic participation had the most time, 99 percent, reported as involving medical judgment. In only two other activities, professional consultation and talks given, did the time exceed 90 percent. The low was 24 percent for purchasing. Five other activities (community activity, enforcement of ordinances, personnel, budget and fiscal, and housekeeping) had 56 percent or less of the time so reported. Eighty-three percent of travel time was tabulated as involving medical judgment. Since this amount of travel time was spent reaching activities reported as involving medical judgment, these trips could not be delegated to nonmedical personnel.

Individual Respondents

Considerable variation occurred among the 186 health officers in the number of programs and the number of activities in which they reported participation during one work week.

One health officer reported time in only 4 programs while another reported time in all 20 used in the analysis. The median reported was 12, the interquartile range was from 9 to 15. Thirty health officers reported participation in 10 programs.

Every health officer reported participation in the general program. Next was the sanitation program, reported by 182 health officers. The two programs participated in by the fewest health officers were disaster and emergencies, and training (fig. 3).

The number of different activities in which

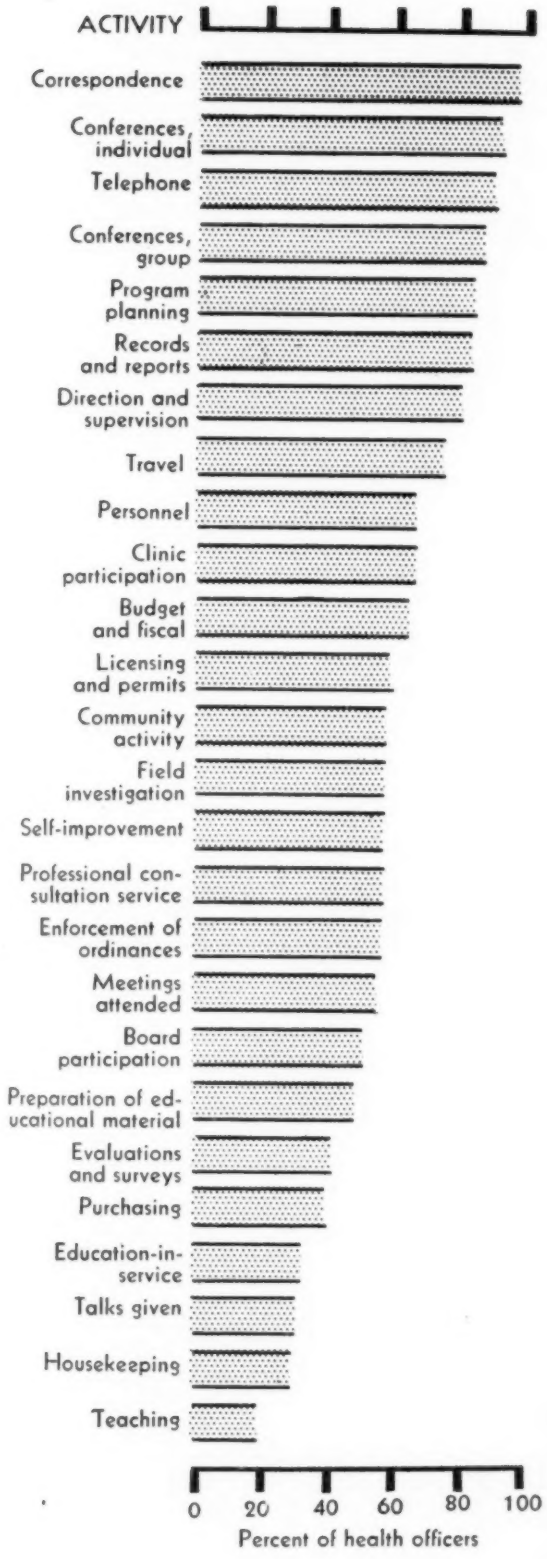

Figure 4. Percent of local health officers participating in each activity.

a health officer reported participation increased with the number of programs. One reported only 7 different types of activities in 7 programs while another reported 25 in 17 programs. Seventeen activities constituted the median, while the interquartile range was from 13 to 20. Each of 28 health officers reported participation in 18 different activities.

Correspondence as an activity was reported by 99 percent and individual conferences by 95 percent of the health officers, while teaching, housekeeping, and talks were reported by the fewest, 18, 30, 32 percent, respectively (fig. 4).

The patterns of participation of the individual respondents in both programs and activities were quite consistent with that of the total except for the largest population group and for State and local health districts.

Conclusions

The day-by-day schedules of a week in the official life of local health officers provided the list of programs and activities used in this study.

Although no special programs or activities can be specifically isolated for delegation to nonmedical administrative personnel, several types of activities within certain program areas might well be examined from this standpoint. Among these are eight activities, representing 33 percent of all time reported, in which no medical judgment was involved: telephone, records and reports, community activity, enforcement of ordinances, personnel, budget and fiscal, housekeeping and errands, and purchasing.

Obviously, some of these activities, such as community activity and enforcement of ordinances, are essential parts of the health officer's official duties, and even though the percent of time in which medical judgment is not involved is relatively large, they could not be delegated. In such activities as budget and fiscal matters, personnel, records and reports, it is possible that the time of the medically trained administrator might be reduced to that required for supervision only.

While the time saved by the health officer through delegating activities not involving medical judgment may not seem significant in

the course of a single working day, it is this time which must provide the margin for extending those activities and services which only the medically trained administrator can provide. With the prevailing shortages of such personnel and the increasing demands for these services both during times of emergency and future program expansion, it is urgent that those activities be identified which, under suitable circumstances, may be delegated to administrative or other personnel who are not medically trained.

Although the median is 76 percent, the range in percent of time in which medical judgment is involved is very wide. This raises the possibility that if further explorations of the extremes in the range could be undertaken, a more adequate basis for evaluation of the time in which medical judgment is involved might be attained.

Delegation of selected activities to responsible persons already in the local health departments, or to persons employed to carry on such activities, will not be easily accomplished and will require an open mind on the part of those charged with planning and administering the public health program. When the local health department has neither the trained nonmedical administrative personnel nor the funds available to provide such special assistants for the health officer, it still may be possible, through careful planning, to reassign some of these duties. Even in small health units, much responsibility can be given to a good clerical worker under the health officer's supervision.

State health departments can provide extremely valuable assistance in the orientation of the local health officer to the need for reexamination of his official responsibilities, in light of present-day conditions, and in the in-service training of his staff members to assume some of the duties mentioned.

There must be an awareness on the part of the health officer of the urgency of getting things done which only he can do and a willingness to permit others to assume such parts of his activities as can be safely delegated. As may easily be seen, there are problems in recruitment, training, supervision, and evaluation areas to be met and solved in saving the time of the health officer for those things he alone can do.

This challenge to public health can be met only through mutual understanding and cooperative action by all concerned, but its successful solution should serve to extend existing medical manpower resources and to make careers in public health increasingly desirable for physicians.

* * *

The basic data for this article are available in limited quantity and may be requested from the senior author.

ACKNOWLEDGMENT

We are indebted in this study to the local health officers who voluntarily took time to record their minute-by-minute activities, and to Elliott H. Pennell for his constructive and helpful suggestions during the preparation of the material.

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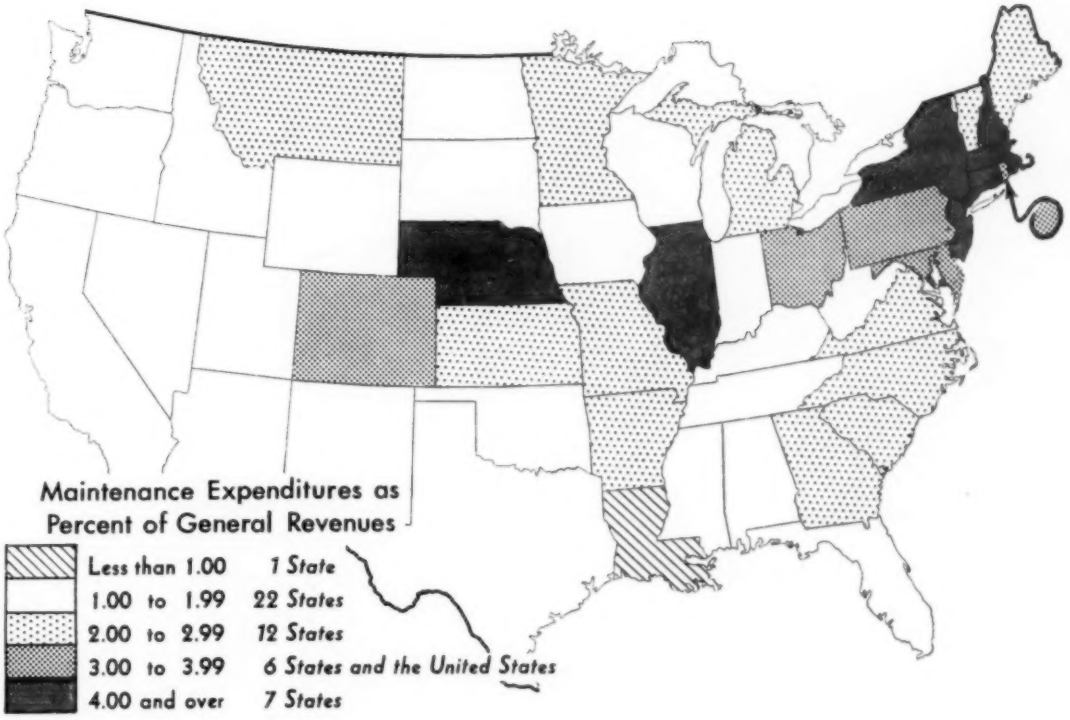
Maintenance Expenditures In Public Mental Hospitals

In Relation to General Revenues of States



A ratio commonly used to measure the cost of care a State provides for patients in its public mental hospitals is the amount of money spent annually for maintenance per patient. Although it is sometimes inferred that States with higher per patient maintenance ratios provide better care, variations in cost of living, in accounting practices with respect to what items are considered as "maintenance," and similar factors will affect to some degree the comparability of such statistics.

Most statements of financial ability of a State have centered around the per capita income concept. However, there are many States where the revenue available for the support of mental hospitals comes from sources besides income or other taxes on individuals. The concept of per capita income, for example, excludes revenues collected by taxes on corporate income or real or personal property. The measure of a State's ability to pay for the cost of public mental hospital maintenance might more realistically be based on all its revenues and not merely on a part.

The data reported here show the degree of correlation which exists between a State's financial ability—as measured by its general revenues—and the amount of money provided for patient care. No attempt is made to determine whether the proportion of total revenue used for public maintenance of the mentally ill in a State is adequate or not since there are no avail-

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able standards whereby adequacy in this sense may be distinguished from inadequacy.

Definitions

Public mental hospitals may be under State or under county control. The former are operated by funds provided by the State and are, of course, dependent on revenues made available to the State. The latter type is financed solely by the county out of revenues available to it. The term "public mental hospitals" used here embraces both State and county mental hospitals. (There is, in addition, one city-operated hospital.)

In one or two States, for instance, the county hospital system accounts for appreciable percentages of resident mental patients found in public mental hospitals in the State. Patients admitted to such county hospitals would, in other States, normally be admitted to State mental hospitals. Thus, data from such States pertaining to average daily resident patient population in State hospitals are not strictly comparable to those from other States unless county mental hospital data are included.

Data in this report exclude information from four State hospitals which did not report data on expenditures. These hospitals, which accounted for 3,339 average daily resident patients during 1950, were: Indiana Hospital for Insane Criminals, Michigan City, Ind.; Richmond State Hospital, Richmond, Ind.; Kentucky State Hospital, Danville, Ky.; and Illinois Neuropsychiatric Institute, Chicago.

County hospitals are found only in the following States: California, Iowa, New Jersey, Tennessee, and Wisconsin. The Iowa county homes, Vernon County Hospital, Viroqua, Wis., and the city-operated hospital, City Hospital for Mental Disease, New Orleans, La., are excluded since they did not report financial data. These hospitals accounted for 1,921 average daily resident patients during 1950.

The term "general revenues" pertains to all revenues available to a State. It also includes county revenues in States where counties operate mental hospitals. It, however, excludes general borrowings as defined by the Bureau of the Census in "Summary of State Government Finances in 1950." For States with county hospital systems there may be some overstatement of general revenues. When a State provides funds for the care, at county hospitals, of patients who are considered to be a State responsibility, both units possibly report such monies as part of their respective general revenues. All data given are for the year 1950.

Table 1 shows, in order by rank, the States' general revenues per civilian, maintenance expenditures per civilian, and maintenance expenditures per patient in public mental hospitals. The base for maintenance expenditures per patient is "average daily resident patient population."

For the United States as a whole there are very low rank order correlations between general revenues per civilian and maintenance expenditures per civilian (+0.18) and between general revenues per civilian and maintenance expenditures per patient (+0.27). This indicates that a State's financial position is apparently no criterion for predicting its relative position with respect to what will be spent for maintenance of its mental hospitals. Delaware is the only State ranking among the first 10 in general revenues which also ranks among the first 10 for the other two ratios.

In table 2 the States are arranged in order by rank of the percent that maintenance expenditures are of general revenues. The lowest percent was 0.93 and the highest 6.58 with a national average of 3.06. About half of the States, 23, spend less than 2 percent of their general revenue to maintain public mental hospitals; 18 spend between 2 percent and 4 percent a year; and 7 spend more than 4 percent.

In general, States west of the Mississippi and those in the South show the lowest maintenance expenditures as percentages of general revenues while those in the Northeast show the highest percentages (see map).

For comparative purposes, table 2 also shows the order by rank of States in terms of resident patient population per 1,000 civilian population. States having a relatively large resident patient population—which to a large extent is a reflection of more extensive facilities—spend higher proportions of their general revenues for maintenance.

Table 3 presents the basic data from which the ratios found in all preceding tables are derived.

Table 1. General revenues per civilian and maintenance expenditures in public mental hospitals per civilian and per patient, United States and each State, 1950

State	General revenues per civilian [1]		Maintenance expenditures per civilian [2]		Maintenance expenditures per patient [3]	
	Rank	Amount	Rank	Amount	Rank	Amount
United States	----	$82.77	----	$2.53	----	$766.05
California	1	139.50	12	2.62	11	859.84
Wisconsin	2	137.73	14	2.52	30	636.84
Louisiana	3	135.99	38	1.26	45	464.50
Nevada	4	133.89	32	1.54	28	657.28
Washington	5	132.10	19	2.12	21	692.75
Wyoming	6	120.00	34	1.47	29	656.31
New Mexico	7	112.12	40	1.15	16	752.19
Oklahoma	8	109.75	23	1.96	33	574.42
Oregon	9	107.92	21	2.09	17	741.03
Delaware	10	106.64	7	3.55	9	862.82
Colorado	11	105.09	5	3.67	5	928.85
Utah	12	99.30	42	1.13	31	616.05
Montana	13	96.10	16	2.37	18	738.86
Michigan	14	95.32	10	2.85	6	910.34
Arizona	15	94.98	28	1.67	1	1,072.96
North Dakota	16	93.75	27	1.68	41	498.71
Kansas	17	90.17	24	1.91	20	724.95
Minnesota	18	87.44	13	2.55	19	737.77
South Dakota	19	87.40	35	1.45	35	564.28
Iowa	20	86.67	31	1.60	22	692.66
Idaho	21	85.88	36	1.43	15	756.38
New York	22	85.62	1	5.53	3	977.91
Florida	23	83.86	30	1.61	24	684.07
Vermont	24	79.33	18	2.23	26	672.01
Maine	25	77.82	22	2.02	27	661.24
Rhode Island	26	77.72	17	2.33	34	569.86
Massachusetts	27	77.48	2	5.10	2	1,009.47
Maryland	28	77.14	11	2.81	12	821.34
Connecticut	29	74.77	3	4.06	4	960.63
Tennessee	30	72.85	47	.89	48	393.51
New Hampshire	31	72.72	4	3.78	13	797.14
Indiana	32	72.46	46	.92	40	505.19
North Carolina	33	71.13	26	1.69	14	784.26
West Virginia	34	70.64	41	1.14	43	492.06
Missouri	35	68.86	25	1.72	36	559.66
Ohio	36	68.60	20	2.11	25	682.43
Arkansas	37	67.33	33	1.51	32	590.95
Virginia	38	66.93	29	1.62	38	520.74
Nebraska	39	65.34	9	3.03	7	877.88
Texas	40	63.90	42	1.13	37	550.44
Pennsylvania	41	63.69	15	2.38	23	686.54
Illinois	42	63.21	6	3.60	8	870.86
Alabama	43	62.59	44	1.03	44	490.13
South Carolina	44	61.38	38	1.26	39	506.76
New Jersey	45	61.27	8	3.32	10	859.95
Mississippi	46	60.27	45	.99	47	426.59
Georgia	47	58.98	37	1.42	42	497.12
Kentucky	48	57.50	48	.85	46	442.75

[1] Sources in footnotes 1 and 3 in table 3.
[2] Sources in footnotes 2 and 3 in table 3.
[3] Sources in footnote 2 in table 3.

Table 2. Maintenance expenditures for public mental hospitals as percent of general revenues and average daily resident patient population per 1,000 civilian population, United States and each State, 1950

State	Maintenance expenditures as percent of general revenues [1]		Average daily resident patient population per 1,000 civilian population [2]	
	Rank	Percent	Rank	Rate
United States		3. 06		3. 31
Massachusetts	1	6. 58	2	5. 05
New York	2	6. 46	1	5. 66
Illinois	3	5. 70	5	4. 13
Connecticut	4	5. 43	4	4. 22
New Jersey	5	5. 42	9	3. 86
New Hampshire	6	5. 20	3	4. 74
Nebraska	7	4. 64	11	3. 45
Pennsylvania	8	3. 74	10	3. 46
Maryland	9	3. 64	13	3. 42
Colorado	10	3. 49	8	3. 95
Delaware	11	3. 33	48	. 57
Ohio	12	3. 08	20	3. 09
Rhode Island	13	3. 00	6	4. 09
Michigan	14	2. 99	18	3. 13
Minnesota	15	2. 92	11	3. 45
Vermont	16	2. 81	16	3. 32
Maine	17	2. 60	23	3. 05
Missouri	18	2. 50	21	3. 07
Montana	19	2. 47	17	3. 20
Virginia	20	2. 42	19	3. 10
Georgia	21	2. 41	25	2. 85
North Carolina	22	2. 38	39	2. 15
Arkansas	23	2. 24	30	2. 55
Kansas	24	2. 12	28	2. 63
South Carolina	25	2. 05	31	2. 48
Oregon	26	1. 94	26	2. 82
Florida	27	1. 92	32	2. 36
California	28	1. 88	23	3. 05
Wisconsin	29	1. 86	7	4. 02
Iowa	30	1. 85	36	2. 30
North Dakota	31	1. 79	15	3. 36
Oklahoma	31	1. 79	14	3. 41
Texas	33	1. 77	41	2. 06
Arizona	34	1. 76	46	1. 55
Idaho	35	1. 67	43	1. 90
South Dakota	36	1. 66	29	2. 57
Alabama	37	1. 65	40	2. 10
Mississippi	38	1. 64	34	2. 32
West Virginia	39	1. 61	35	2. 31
Washington	40	1. 60	21	3. 07
Kentucky	41	1. 48	42	1. 92
Indiana	42	1. 27	45	1. 82
Wyoming	43	1. 23	38	2. 24
Tennessee	44	1. 22	37	2. 26
Nevada	45	1. 15	33	2. 34
Utah	46	1. 14	44	1. 83
New Mexico	47	1. 03	47	1. 53
Louisiana	48	. 93	27	2. 70

[1] Sources in footnotes 1 and 2 in table 3.
[2] Sources in footnotes 2 and 3 in table 3.

Table 3. General revenues, public mental hospital maintenance expenditures, patient populations, and civilian populations, United States and each State, 1950

State	General revenues [1] (in thousands)	Maintenance expenditures [2] (in thousands)	Average daily resident patient population [2]	State civilian population [3]
United States	$12, 371, 261	$378, 836	494, 526	149, 451, 000
Alabama	191, 156	3, 139	6, 404	3, 054, 000
Arizona	70, 854	1, 245	1, 160	746, 000
Arkansas	128, 666	2, 881	4, 875	1, 911, 000
California	1, 453, 734	27, 347	31, 805	10, 421, 000
Colorado	138, 717	4, 847	5, 218	1, 320, 000
Connecticut	150, 142	8, 149	8, 483	2, 008, 000
Delaware	34, 018	1, 131	1, 311	319, 000
Florida	230, 272	4, 424	6, 467	2, 746, 000
Georgia	201, 589	4, 842	9, 740	3, 418, 000
Idaho	50, 927	850	1, 124	593, 000
Illinois	550, 348	31, 307	35, 950	8, 707, 000
Indiana	286, 299	3, 625	7, 176	3, 951, 000
Iowa	228, 458	4, 207	6, 074	2, 636, 000
Kansas	171, 418	3, 622	4, 996	1, 901, 000
Kentucky	167, 968	2, 486	5, 616	2, 921, 000
Louisiana	363, 766	3, 358	7, 229	2, 675, 000
Maine	71, 438	1, 851	2, 800	918, 000
Maryland	178, 575	6, 503	7, 918	2, 315, 000
Massachusetts	362, 392	23, 852	23, 628	4, 677, 000
Michigan	608, 827	18, 181	19, 972	6, 387, 000
Minnesota	262, 323	7, 645	10, 362	3, 000, 000
Mississippi	130, 656	2, 145	5, 028	2, 168, 000
Missouri	273, 231	6, 821	12, 187	3, 968, 000
Montana	57, 273	1, 411	1, 910	596, 000
Nebraska	87, 098	4, 036	4, 597	1, 333, 000
Nevada	21, 020	241	367	157, 000
New Hampshire	38, 834	2, 017	2, 530	534, 000
New Jersey	296, 107	16, 049	18, 663	4, 833, 000
New Mexico	76, 014	782	1, 040	678, 000
New York	1, 275, 094	82, 419	84, 281	14, 892, 000
North Carolina	286, 947	6, 808	8, 681	4, 034, 000
North Dakota	58, 595	1, 049	2, 103	625, 000
Ohio	545, 463	16, 774	24, 580	7, 951, 000
Oklahoma	243, 544	4, 344	7, 562	2, 219, 000
Oregon	164, 248	3, 182	4, 294	1, 522, 000
Pennsylvania	670, 701	25, 035	36, 465	10, 531, 000
Rhode Island	60, 232	1, 805	3, 167	775, 000
South Carolina	129, 266	2, 644	5, 217	2, 106, 000
South Dakota	57, 423	953	1, 689	657, 000
Tennessee	239, 385	2, 926	7, 436	3, 286, 000
Texas	485, 331	8, 600	15, 623	7, 595, 000
Utah	68, 615	779	1, 264	691, 000
Vermont	30, 146	849	1, 263	380, 000
Virginia	215, 905	5, 212	10, 008	3, 226, 000
Washington	306, 864	4, 934	7, 123	2, 323, 000
West Virginia	141, 988	2, 284	4, 641	2, 010, 000
Wisconsin	475, 314	8, 829	13, 864	3, 451, 000
Wyoming	34, 080	417	635	284, 000

[1] State general revenues from "Summary of State Government Finances in 1950," G–SF50–No. 1, U. S. Bureau of the Census, Washington, D. C. County general revenues from appropriate State reports except Wisconsin; Wisconsin through personal correspondence with the Department of State Audit. [2] From unpublished and preliminary data for the 1950 Census of Patients in Mental Institutions, Biometrics Branch, National Institute of Mental Health. [3] Current Population Reports, Population Estimates, Series P–25, No. 50; Civilian Population as of July 1, 1950, U. S. Bureau of the Census, Washington, D. C.

Human Relations in Occupational Health

By DALE C. CAMERON, M.D., M.P.H.

Human relations are common, everyday experiences in our professional and personal lives. In fact, they are so familiar that all of us have pretty definite ideas about their importance and how they should be handled. I shall make no attempt to offer you new facts or findings based on recent studies, but we may be able to do some joint thinking as to the place of human relations in occupational health, for such problems frequently bring people to the medical department. I hope, too, we may obtain a clearer perspective of the ways in which we may approach these problems in our own professional activities.

It is probable that definitions of "occupational health" and "human relations" are unnecessary. However, I offer the following definitions in order that you may be certain of my meaning as I use these terms.

A good occupational health program is one carried out primarily for the benefit of the workers. It has as its objectives:

1. The assessment of a worker's physical and psychological assets, as well as his liabilities, to facilitate proper selection and placement.
2. The prevention of occupational and nonoccupational illnesses.
3. The provision of treatment, the type and extent of which depends on the policy of the organization.
4. The fostering of a personal, physical, mental, and social ability to work and enjoy life beyond the mere absence of disease or infirmity.

Dr. Cameron is chief of the cooperative health services branch, Division of Occupational Health of the Public Health Service. *This paper was presented at the United States Navy Fourth Industrial Health Conference, Cincinnati, Ohio, April 20, 1952.*

Manner vs. Matter

Human relations have to do with the nature of interpersonal contacts between individuals and groups of individuals—how people get along with each other.

That the manner in which these contacts are made has a bearing on the result has been too little appreciated. Yet, this bearing, in many cases, is as great as, if not greater than, the apparent topic or purpose of the exchange. We find this to be true, for example, in the experience of the person who habitually orders others to do his bidding, acts as though he has the weight of the world on his shoulders, fails to consider the personal needs of his subordinates, and neglects to acknowledge work well done. As a rule, such a person does not earn the confidence and cooperation of his fellow workers as much as another who makes the same requests, but pleasantly and considerately. The topic or purpose of the exchange may be identical, but the difference in manner and method of contact results in a different response. The second individual intuitively knows or has learned some of the principles of human relations and applies his knowledge, while the first either does not know or fails to practice what he does know.

Effect on Health

The recognition that human relations can, and do, exert a marked effect on health should

be a fundamental concept of every health program. It has an important bearing on the success with which plans are executed for the selection and placement of workers, the prevention of illness and absenteeism, the provision of medical care, and the fostering of health.

To assess properly the health effects of human relations in industry, let us first look at the sickness absenteeism problem. Figures based on limited studies in this country and in England indicate that about 30 percent of all sickness absenteeism is due to emotional disorders. Although we may not know exactly to what extent problems of interpersonal relations are causatively related to the emotional disturbances of a given individual, many studies indicate that they are often major factors. That these emotional disturbances, in turn, affect physical health and efficiency has been amply shown by developments in the field of psychosomatic medicine.

Much of the absence occasioned by emotional problems probably is due to poor human relations in and outside the work place. Other sickness absenteeism is also caused in part by poor human relations. The relatively high absence rates in groups suffering from poor supervision is striking (*1*). Many of the illnesses among industrial workers can be prevented or alleviated by good in-plant health services, but the problems of human relations cannot be cleared up by the dispensing of medicine, or by exhaust ventilation. Good human relations can be achieved only when everyone in the plant understands their importance and is sincerely motivated to improve relations with one another.

Our concern, then, is to try to improve the way in which we in occupational health departments deal with people, and the way they deal with us and with each other. This activity cannot be a unilateral effort on the part of the medical staff, for it also requires the combined skills of the personnel department, counselors, management, and labor. Only through such a team approach can each individual be helped to achieve more fully his own potential so that he may have a better opportunity to advance himself and to make greater contributions both as a worker and a citizen.

Implicit in the question of interpersonal relations is the need for proper understanding of attitudes and behavior and recognition of the fact that behavior just doesn't happen—there is a reason for the way people behave. Individuals simply do not divorce themselves from their personal, family, and community concerns and attitudes when they enter into the work place. Likewise, at the end of the business day, they do not automatically "shed" their job problems. Consequently, the health of workers is intimately related to the things that go on not only in the plant or business, but also in the home, the community, and the Nation.

Basic Human Needs

To approach the problem of human relations in occupational health, one must first recognize some of the basic human needs which most people bring with them to their jobs. They want to know what is going on in the plant and why things are done as they are. They want to know what their jobs are, what is expected of them, and where they stand in the organization. They hope to be treated in a considerate, predictable manner.

As they find their places in the plant, they expect a certain amount of recognition of their status in relation to experience, skill, and seniority. While speaking of recognition, one must not forget that most workers usually want some recognition of their job status from their families as well as from their fellow workers. Failure to get it may increase their demand for recognition at the plant.

Job satisfaction is very important to most workers. Some obtain it from the fabrication of products of fine craftsmanship. Others derive their major work satisfaction from the creation of new ideas, tools, processes, or procedures. Still others are unable to produce fine craftsmanship or new ideas, and the necessity to do so would threaten their job satisfaction and security. Such workers often are most satisfied with a relatively simple, repetitive type of operation. Particularly important in job satisfaction are the degree to which the job approaches the worker's own aspirations and the opportunity afforded to achieve them.

Pay, though important, is often assumed to

play a greater role than it actually does. In several studies, various types of job satisfaction have been rated as more important by the majority of workers. In general, it may be said that pay often assumes greater importance as the degree of job satisfaction declines.

Another important human need is that for security, which includes not only some means of providing for the later years of life, but also confidence in the continuity of work and opportunity for advancement.

These needs may vary in intensity from one individual to another, but the fact remains that they are present in some degree in most individuals. Many other human characteristics have a bearing on the ways in which these basic needs can be satisfied. For example, some people seem to thrive on responsibility, whether or not they handle it well, while others are more comfortable with minimal responsibility—more secure if they don't have to take chances. Some like repetitive tasks, while others become bored with such work and require more variety. Some are satisfied only if they can work out broad programs or do work requiring only gross manipulations. Still others prefer working out minute details or finishing materials to fine tolerances after the broad structure has been laid out. Not a few like to follow through an entire operation requiring both gross and meticulous work. Most people are content only when working closely with, or in the presence of, other individuals, while some prefer fairly long periods of relative isolation.

What happens when these basic human needs are not adequately satisfied or when an individual is placed in a job for which he is quite unsuited? Since man is remarkably resilient and adaptable, most people go ahead and do a creditable job although at a cost to themselves and their associates. But not a few find that they become indifferent to the job, preoccupied with other affairs, anxious and tense, or actively disgruntled and complaining. Some may become more accident-prone. Others may translate their difficulties into physical symptoms, presenting a remarkable variety of psychosomatic problems.

Such individuals appear with increasing frequency in the physician's office, in the complaint department, and on the sick-absence list. Since these problems lead to increased sick absences and need for medical care, the occupational health department cannot fail to be interested, not only in the symptomatic treatment of patients with complaints, but also in the removal of those etiologic factors that may be present in the plant. The plant medical department has a stake in the reduction of sickness absenteeism to the bare minimum.

Job Placement

There are many different human physical and mental characteristics and abilities. Various jobs demand different levels of physical stamina and agility, different personality characteristics, and levels of ability and skill. The amazing thing is that, knowing this, we have been quite lackadaisical about trying to fit the man to the job. It has not been long since job matching was limited to "You look strong, you're hired." Now, of course, many places have analyzed their jobs so that the physical requirements of a given position are known and the applicant is checked to see if he can meet them. But it is indeed the exception to find a plant where the psychological requirements of the positions have been analyzed. Some little attention has been given to executive and supervisory positions, but very little to the bulk of jobs available. Actually, so far as psychological requirements are concerned, we are not even up to the point where we say, "You look strong, you're hired." Rather, we are still at the level where, if we were honest, we would say, "I think I know what I want, but I'm not sure, and I don't know much about you—you're hired."

Perhaps human characteristics are so common to the experience of us all that we either give them little formal thought or believe we understand them well enough to make consistently good judgments about them. Many individuals do a remarkably good job of assessing quickly the characteristics and needs of others, but most of us apparently do not, particularly when confronted with long lines of prospective employees and a minimum of time. The point is that most managements would not allow a judgment to be made after cursory observation of a piece of machinery—say a conveyor—that is to be purchased. Even though

any conveyor might serve the purpose, care is taken to examine all types—belt, chain, screw, and others—to determine which would be most efficient in a given operation. Yet, in the case of labor, which constitutes a major cost in most industries, we fail to analyze the psychological requirements of the job and assess the psychological characteristics of a man before putting him on the job. What is required is a little systematic thought about the basic needs of people and how these needs may be satisfied in the work situation.

Once having made the best possible judgment as to job placement, however, it is not enough to stop at that point. A certain amount of follow-up is necessary, not only to evaluate and improve selection and placement techniques, but also to detect any errors in placement at the earliest possible moment so that a more suitable position may be found. All these steps require that the people in the health and personnel departments, as well as those in management, have an intimate knowledge of the plant and working conditions, know as many of the workers as possible, and have a genuine interest in people.

In short, the practice of good human relations can be boiled down to the simple phrase—it is important not only what you do, but how you do it. Those who are concerned with the how as well as the what of interpersonal relations usually practice good human relations.

REFERENCE

(*1*) Hazard, W. G.: Putting absence records to use. Am. J. Pub. Health 41: 1087–1095 (1951).

Insect and Rodent Control Field Training Courses

Field training courses in insect and rodent control will be conducted by the Public Health Service Communicable Disease Center in Atlanta, Ga., July 14–25, and August 11–22, 1952. The first of the series was held in June. These 2-week programs are planned as refresher training for persons who have had experience in insect and rodent control or who are responsible for such activities. They are available to personnel of State and local health departments, the Public Health Service, and public health departments of foreign countries. Those who are preparing for public health assignments overseas will also find these programs of value. Persons from other organizations concerned with insect and rodent control will be accepted if facilities permit.

More comprehensive training courses are scheduled for September 22–October 3 (insect control) and October 6–24, 1952 (rodent control).

Application should be made by letter to: Officer in Charge, Communicable Disease Center, Public Health Service, 50 Seventh Street NE., Atlanta 5, Ga., Attention: Chief, Training Branch.

Public Health in Industrial Dentistry

A Symposium in Brief

The symposium briefed here was presented before the American Association of Industrial Dentists during the 1952 Industrial Health Conference in Cincinnati, Ohio. Dr. C. R. Fricke, dental director of the Duquesne Light and Power Company, Pittsburgh, Pa., was chairman of the discussion, which was held on April 24. Full texts of the papers are expected to be published in the Journal of Industrial Medicine and Surgery.

Dental Services in Industrial Plants

PHR brief

Today, for an industrial population of 60 million, we know of only about 160 dentists, trained or experienced in industrial dentistry, who are providing scheduled service in industrial plants. An additional 1,000 are "on call," but they have had little or no training or experience in the recognition of oral manifestations of occupational diseases. Only one dentist is engaged on a full-time basis in industrial hygiene at the State level.

History

Industrial dental programs designed to treat accident or compensation cases were reported as early as 1914–15. The early history of these programs compared favorably with that of industrial medical services, but industrial dentistry did not keep pace with the expanding concept of industrial medicine. While the latter evolved from treatment of compensation cases to study of occupational diseases, industrial dentistry showed little inclination to study the effects of the environment on the oral structures. Emphasis in dental research has been placed chiefly on dental diseases common to children; consequently, industrial dental programs have remained more or less static.

Another obstacle has been the difficulty of evaluating preventive dental health services in industry. Reduced absenteeism, lower accident rates and workmen's compensation costs, and increased production have all been proposed as criteria, but they have had limited value. However, enough is known about the benefits of industrial dental programs to warrant their extension in industry.

Today's broadened concept of occupational health embraces the total health of the worker—nonoccupational as well as occupational influences. In keeping with this concept, industrial dental programs must be designed to prevent such nonoccupational diseases as caries and diseases affecting the dental tissues, as well as occupational diseases. With the exception of the use of fluorides, the preventive methods for control of nonoccupational diseases among adults parallel those for children—proper diet,

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good oral hygiene practices, and early correction of dental disorders. Industrial dental programs seek to serve these ends through early diagnosis and encouragement of early treatment and proper oral hygiene practices.

In addition to observing caries and diseases of the periodontium, the dentist can detect early malignant processes in the oral cavity and on the face. Since early malignant lesions are relatively asyptomatic, the patient is probably not aware of their importance. Furthermore, the dentist has more opportunity for early detection than the physician, who usually sees people only when they report to him for specific treatment.

Dental Health Education

As soon as a preventive method has been developed and demonstrated to be effective, another important job confronts the dentist. He must promote widespread application of the method. This is an exceedingly complex job because it involves human attitudes, decisions, and actions. It involves public education, community participation in program planning, expenditures of private and public funds, training and availability of personnel to provide the service, administration and evaluation of the program, and many other activities. It requires a great deal of work on the part of many people in a community.

To conduct such a program successfully, cooperation is needed at all levels—between patient and dentist, among dental, medical, and citizen groups, and between industrial public health workers and local professional groups.

To assure such cooperation, a program of popular health instruction must be undertaken by the profession. Such a program should aim toward neutralizing the psychological factors of procrastination, indifference, and fear. It should bring knowledge of dental health to all groups and motivate them to apply that knowledge in their individual oral hygiene. A strengthening of our present educational activities would go far in stimulating public interest in dental health.

Dental programs have not yet begun to realize their potential to the extent that medical programs have. There is need for expansion of effort. The establishment of dental programs in industry can contribute materially to raising the oral health level of the whole country.

Community Approach to Dental Health

PHR brief

Many estimates have been made during the last several years of the needs for dental care in this country. A review of these estimates presents a fairly comprehensive picture of the national dental health problem:

1. Children between 6 and 12 years old need 280,000,000 fillings to restore their mouths to a healthy condition, and adults need 425,000,000, a total of 705,000,000. In 1950, dentists placed 135,000,000 fillings, about 20 percent of the number required. It would thus take five times the number of dentists we now have to catch up with the backlog of needed fillings.

2. Children would need 38,000,000 fillings every year to keep up with new cavities, and adults would need 100,000,000.

3. In 1950 dentists performed 48,000,000 extractions. No one knows or will even estimate the number needed.

4. In 1950 dentists made 1,500,000 crowns, bridges, and full and partial dentures. Again, no attempt has been made to estimate the number needed.

These figures represent a staggering amount of dental care. Yet to these figures must be added the need for an unknown quantity of dental and roentgenographic examinations, diagnoses, prophylaxes, topical fluoride appli-

By W. Philip Phair, D.D.S., assistant secretary, council on dental health, American Dental Association, Chicago, Ill.

cations, periodontal treatments, orthodontic care, oral surgical operations, root canal treatments, and other dental health services.

One of the brightest spots in this picture is the possibility of reducing a significant part of the problem in future years through the fluoridation of public water supplies.

Personnel Needs

The amount of dental work that can be done is limited by the number of persons qualified to perform dental operations. The bureau of economic research and statistics of the American Dental Association estimated in 1950 that there were about 74,000 active non-Federal dentists, of whom approximately 72,500 were doing chairside dentistry. During the last 10 years, the population of the Nation has increased about 15 percent while the number of dentists has increased about 11 percent. The number of civilians per practicing civilian dentist in the Nation is now about 2,100, the ratio varying in different sections of the country.

The dental education program in the United States is now geared toward reducing the number of persons per dentist. In the last 10 years, the total number of undergraduate dental students has increased by nearly 60 percent. New schools have recently been started, and presently established schools are expanding their facilities. In addition, the effects of the concentration of dentists in larger cities are less pronounced now than in former years because of modern methods of transportation.

Costs

In spite of the fact that only a small part of the public is seeking adequate dental care, Americans are spending approximately a billion dollars each year for dental care. In addition the Veterans Administration is paying $40,000,000 a year to home town dentists for veterans' service-connected dental benefits, exclusive of dental care given at veterans' installations.

Add to these figures the toll represented in terms of general health, personal appearance, social adjustment, comfort, financial burden to individuals and taxpayers, and school and industrial absences, and you have something staggering enough to convince anyone that a problem exists.

What can be done about it? The answer lies in more efficient use of our present resources, rational development of new resources, research in the preventive field, increased application of preventive measures, and dental health education of the public.

Community Dental Health Program

The American Dental Association has long believed that needs can best be determined and met through individual and community effort. The approach to the problem of improved national dental health must be made largely through the development of community dental health programs.

Attributes that might be ascribed to a forward-going community dental health program, and most of them will also apply to industrial programs, include: (1) The program is attacking the community's dental health problem in a systematic manner. (2) It is successfully motivating people to assume personal responsibility for health, rather than unintentionally encouraging dependence on industry and government. (3) It is based on education, prevention, and early detection and correction of defects, rather than giving myopic and complete attention to the results of neglect. (4) It is an integral part of the over-all community or industrial health program. (5) It is buoyed by a continuous information program for its sponsors—whether they be community citizens or industrial management. (6) It is being evaluated scientifically on a periodic basis. (7) Probably most important, it has been planned with, and is receiving the constant consultation of, representatives of the people in the community and the dental profession.

Even though all groups do not have the same consciousness of need, the lay public, labor organizations, and the practicing dentists in the community all can and will contribute generously toward the development and maintenance of their dental program. Time and again it has been shown that when all are a part of the planning, agreement on methods of

accomplishing the objective of improved dental health is not as difficult as one would suppose.

During the past several years, common agreement has been reached on the purposes of dental health programs and on the basic principles by which they should be governed. The development of guiding policies is, of course, a continuing endeavor.

A tremendous potential exists within communities for the improvement of dental health. This potential can be realized through community action programs, developed by citizens groups, with the assistance of private dentists, public health and industrial dentists, and all health personnel on the local, State, and Federal levels.

Establishment of Industrial Programs

PHR brief

We have before us today the brightest picture in prevention we have had in the history of dentistry. We are seeing the greatest interest yet shown by the layman in the care of his mouth. We stand to see a steady decline in the tooth decay rates of children treated with or consuming fluorine salts. We also see a tremendous growth in the corrective clinics established by health departments, school systems, and philanthropic organizations. But what is being done about the dental health of those over their elementary or even high school years? Are they to be left to drift?

The logical place to contact these people is at their places of employment, but the public health dentists and the private dentists cannot accomplish the job alone. It will take the best efforts of the rapidly growing group of industrial dentists.

Benefits of Program

The first efforts of the industrial hygiene dentists must be directed to assembling facts and statistics which will show management the need for and the benefits that can be expected from an industrial dental program. We must give them facts concerning hours lost, days lost, and material and production lost through dental disability. It must be brought to their attention that absences are due not only to actual toothaches or local infection treated, but to diseases and conditions resulting from dental focal infections. Kolmer lists these: (1) the infectious arthritides; (2) rheumatoid or atrophic arthritis; (3) fibromyositis and bursitis; (4) neuritis; (5) subacute bacterial endocarditis; (6) iritis and other infections of the eyes; (7) pyelonephritis and other infections of the kidneys; (8) cholecystitis; (9) phlebitis and thrombophlebitis; (10) erythema nodosum; and (11) some cardiac arrhythmias; and also general debility, fatigue, anorexia, loss of weight, excessive drowsiness, headaches, hypochromic normocytic anemia, acquired hypotension, and reduced immunological resistance. These may be prevented or medical treatment aided by adequate dental examination and treatment.

Current Programs

Two industrial dental programs are now operating in Louisville. One of the programs is limited to visual examination, conference, and referral. The other, sponsored by the Louisville District Dental Society and started at the request of the company, is more comprehensive. It includes clinical examination, education and instruction in dental hygiene, referral, recall examination, and maintenance of records.

As a result of the latter company's request, the dental society formed an Industrial Dental Health Committee, which established the following requirements for the program:

By J. R. Robinson, D.D.S., director of dental health, Louisville and Jefferson County Board of Health, Louisville, Ky.

1. Examination must be performed by a dentist licensed by the State of Kentucky, and this appointment must be approved by the committee.

2. The participating company and committee must agree that the reference list consist only of members of the Louisville District Dental Society.

3. The company dentist shall refer each employee to his own dentist or shall issue a list, as above, from which he may make a choice.

4. In an emergency, the company dentist may give treatment.

5. Any employee who has regular dental care may present certification of this care in lieu of recalls and re-examinations by the company dentist.

The plan is in action and is offering an excellent service. Employees are seeking dental corrections, and it is anticipated that production will benefit from decreased physical slow-downs and days lost from work.

Responsibility of the Association

PHR brief

The objective of the American Association of Industrial Dentists is "to unite into one organization members of the dental profession and other persons or groups engaged or interested in industrial health, for the purposes of sponsoring the study and discussion of oral health as related to industrial health, productivity, and safety; standardizing methods for the conservation or improvement of oral health among persons in industries; initiating preventive industrial dental procedures; promoting a more general understanding of the purposes and results of dental health care of persons in industry; and encouraging the development of new industrial oral health programs and promoting mutual understanding with other categories of industrial hygiene personnel."

Convince Management

A first step toward these objectives must be to convince management that an industrial dental health service should be a part of the over-all health picture. Industry will generally not seek this service. They will not come to us and say, "We want a dentist for our health services," until they have been made conscious of the need for such a service.

One approach to this problem is the promotion of demonstration programs in the plants, a method which has been used for several years in Pennsylvania. Equipment may be moved into a plant and a survey made of the dental health of the employees. The results should successfully demonstrate the need for a dental care program.

Further convincing evidence may be in the form of statistics. Insurance statistics show that employees with poor mouth conditions have a greater incidence of illness resulting in absence from work than those with good mouth conditions. Current surveys corroborate this statement, revealing an average of 4½ days per employee per year lost from work because of toothache or some dental ailment. An industrial manager should have only to consider such figures to see that a dental care program can save the plant money by reducing absenteeism.

Work With Labor Organizations

Cooperation with labor organizations has been suggested as an approach to the problem of establishing industrial dental health programs. Since we are confronted with the fact that in many instances these groups are setting up their own health services, would it not be advisable for this association to cooperate in planning the programs so that they will organize the type of program we know to be most practical?

By Edward R. Aston, D.D.S., secretary of the American Association of Industrial Dentists and industrial dental consultant, Pennsylvania State Department of Health, Harrisburg, Pa.

Educate Management and Employees

Another important responsibility is a dental health education program directed not only to employees, but also to management personnel. In fact, it is very important that management accept such a program before it is presented to the employees.

The education program may include the use of films, oral health classes, individual conferences, posters, pamphlets, and anatomical charts. Individual conferences are generally considered the best method.

Enlist Aid of Industrial Nurse

One of the best means of furthering dental education programs is to enlist the services of the industrial nurse. The nurse has proper background for presenting to both the employee and management the problems confronting them in a health service and also the results that will be attained by solving these problems.

The nurse employed in a plant having an in-plant dental program may also be of service in assisting the dentist in periodic oral examinations and in giving treatment and emergency care. The nurse can also assume the responsibility of following up these employees to determine if correction has been obtained.

Furthermore, the industrial nurse has a wealth of opportunities to promote oral health through education since so many of her contacts with employees are under conditions which make them receptive to health information.

Community Dental Health Programs

Participation of various groups in community dental health programs was the theme of three papers presented at the dental health section of the twenty-first annual meeting of the Southern Branch of the American Public Health Association in Baltimore, Md., April 17, 1952. These papers appear here in abbreviated form. They are being published in full in the Bulletin of the American Association of Public Health Dentists.

State Health Departments

PHR brief

State health department personnel can and should play the roles of assister, encourager, promoter, stimulator, and even needler in local dental health programs. They should never, however, attempt to be dictators. The following principles may be helpful as guides in promoting community programs.

1. Programs should be planned with people, not for people.

2. Inviting people to help plan a program will elicit greater response in terms of time and money than trying to "sell" them one already planned.

3. People are convinced by what they find out for themselves, not by what they are told.

By Carl L. Sebelius, D.D.S., M.P.H., director of dental hygiene service, Tennessee Department of Public Health, Nashville, Tenn.

4. Health programs need people who are not already overworked in other programs.

5. Every health service can be a springboard for health education.

Specific activities in which State health departments can be of assistance are described below.

Dental Health Education

Dental health education activities should be directed to four community groups: nonprofessional groups, school groups, public health workers, and dentists.

State health department personnel may be assigned to school groups to give talks, show motion pictures, consult with parents, and give clinical demonstrations. They may contact citizen groups by participating in local dental health conferences, discussing such subjects as water fluoridation, the role of carbohydrates in dental decay, and the need for more adequate dental service.

Postgraduate seminar programs conducted by the State health department can be an effective means of informing both dentists and public health workers of the latest developments in dental practice and procedures.

Preventive Dental Services

The development of topical fluoride programs and the promotion of controlled water fluoridation and carbohydrate control are the main activities in this field. One example of State health department aid is the topical fluoride treatment program recently carried out in one large school. The local PTA paid for the services of the dental hygienists, and the State health department furnished supervision and equipment.

The promotion of controlled fluoridation should be primarily a local activity, but a State health department can serve as a source of information and can provide leadership. An example is the recent dental health workshop conducted by the State dental association, in which the State dental director, the assistant director of the division of sanitary engineering, and the commissioner of health presented factual information. The proceedings of this meeting have been published and can serve as a source of information for local groups.

Remedial Dental Activities

The State health department can assist in planning, organizing, and operating dental clinics. They can furnish equipment and supply lists, aid in obtaining personnel, and provide consultant services upon request. They may also loan portable equipment for use by local dentists in operating remedial programs in schools.

Evaluation

Statistical summaries of dental findings may be very useful in demonstrating the need for a well-organized dental program. State department personnel can be of service in making such summaries by providing forms to be used as an evaluation tool.

The Dental Hygienist

PHR brief

The history of dental hygienists dates back to the early 1880's, when Rhein suggested that dentists undertake to train women as "dental nurses to cooperate with dentists in cleaning and polishing the teeth, massaging the gums, and applying remedial agents. . . ." In 1887, C. M. Wright of Cincinnati, Ohio, pointed out that the work of the dental hygienist is an important factor in preventive medicine. It was not until 1916, however, that legislation was passed allowing dentists to employ dental hygienists. The way was thus paved for the introduction of the dental hygienist as a licensed practitioner of prophylactic dentistry.

By Louise C. Coira, R.D.H., supervising dental health educator, Pennsylvania State Department of Health, Harrisburg, Pa.

School Programs

One of the dental hygienist's most important roles is her part in the school health education program. Here she should be on a par with the public school teacher, teaching the children proper diet and how to have clean teeth. The hygienist, appearing in uniform, may arouse the children's interest in dental health by means of stories, rhymes, songs, plays, dramatizations, and tooth-brush drills.

If time does not permit the school dental hygienist to carry out such educational activi- English, art, music, spelling, mathematics, and, provide them with information. Dental health can be correlated with many other subjects: English, art, music, spelling, mathematics, and, in high school, chemistry and home economics.

Follow-up work is another important duty of a school dental hygienist. It is often not enough to send notices home to parents notifying them of dental corrections their child needs; it may also be necessary to make visits to the home. In addition, notices to parents complimenting them on the condition of their child's mouth when corrections have been made, or even if no corrections are needed, may be advisable.

The school dental hygienist should also include in her program the topical application of sodium fluoride. Not every pupil can be given these treatments in a school year, but one or perhaps two grades can be selected for the treatments. Since these treatments are recommended at the ages of seven and ten, the grades selected will probably be two and five. Some hygienists find that they can treat only one student at a time, but others find the "multiple chair" technique can be applied effectively. That is, while the fluoride solution is drying for the necessary 3 minutes on one patient, treatment can be begun on a second and then on a third patient.

Community Activities

The dental hygienist should let it be known in the community that she is available to address groups such as the PTA and service clubs on dental health. Seeking their aid and cooperation in promoting local dental health programs is most important.

The dental hygienist should also maintain close contact with the dental profession. The cooperation of the dentists in the community is very necessary to the success of a dental health program.

Dental Hygienists in Pennsylvania

At present there are 143 dental hygienists employed in the public schools of Pennsylvania, in 132 districts. The dental health programs in these 132 districts include activities in education, prevention. and correction. However, there are many additional districts that have a corrective clinic and a sodium fluoride program but do not employ a dental hygienist.

On the staff of the Pennsylvania Department of Health are six dental hygienists, who are classified as dental health educators. The duties of four include contacting the public school dental hygienists at least once every year to advise and aid them. Of the other two, one is responsible for the department's sodium fluoride program, and the other handles the preschool dental program.

The Dental Profession

PHR brief

The "Principles of Ethics" of the American Dental Association contains the following provision, which indicates the role the dental profession should play in State and local dental health programs:

"The dentist has the obligation of providing freely of his skills, knowledge and experience to society in those fields in which his qualifica-

By Allen O. Gruebbel, D.D.S., M.P.H., secretary, Council on Dental Health, American Dental Association, Chicago, Ill.

tions entitle him to speak with professional competence. The dentist should be a leader in his community, especially in all efforts leading to the improvement of the dental health of the public."

Leadership by the dental profession is almost always an essential element in a successful community dental health program—leadership in studying and analyzing dental health problems and the resources needed to solve them; leadership in the establishment of facilities for the continuing education of dentists in matters concerned with the dental health of the public in general and dental health of children in particular; leadership in procuring the cooperation and active support of other professional and civic organizations; and leadership in the adoption of community plans which are best suited to the needs of the community.

As an illustration of what the dental profession is doing to supplement the work of State and local health departments, some of the activities of the State dental societies in California and Tennessee are outlined.

California

The California State Dental Association's dental health education committee, composed of about 140 members from all sections of the State, produces and distributes a large volume of educational material. During Children's Dental Health Week last year, for example, 263,000 dental health leaflets were distributed through the various component societies. Members of the committee are also instrumental in obtaining the assistance of local civic organizations in community dental health projects.

In promoting fluoridation of public water supplies, the California State Dental Association has found that one effective method of obtaining local approval is the organization of a citizen's committee. Such a committee, working with the dental society, can procure the support of interested community organizations.

Another activity which had unusual success was the bitewing X-ray demonstration at the 1951 California State Fair. Bitewing X-ray inspections were given to 2,983 children, and the demonstration and accompanying exhibit were viewed by an estimated half million people. For the X-ray examination, a double film pack was used. One copy of the film was sent to the parents, who were urged to take it to a dentist for interpretation, and the second copy was used for statistical analysis.

The Southern California State Dental Association, also, has an extensive dental health education plan. One of its main purposes is to encourage dental practitioners to participate in educational activities in their own communities. The association has produced a series of transcriptions for use in radio and in schools and a film which is used not only in California but in most of the other States as well. About 150,000 pamphlets are distributed annually, and plans are under way to send 300,000 pamphlets to the members of the society for use in dental reception rooms and for other dental health education purposes.

Tennessee

Since 1949, the Tennessee State Dental Association has held annual dental health workshops, attended by nonprofessional as well as professional persons. Accomplishments of these workshops include (1) establishing of dental clinics in five communities, (2) reopening of the school for dental hygenists at the University of Tennessee College of Dentistry, (3) establishing of dental services in general hospitals, (4) opening of dental clinics in health centers, (5) purchase of mobile dental units by three counties, and (6) plans for a number of fluoridation projects.

The Tennessee association works closely with the State department of education for the development of more effective dental health instruction in schools and with the State department of health in many of its activities.

Pretesting: A Positive Approach to Evaluation

By ANDIE L. KNUTSON, Ph.D.

Persons responsible for health education programs have expressed need for some objective means of identifying the strong and the weak points in educational programs while changes are still possible.

Tests can be applied to health education activities while these activities are being planned and carried out. The positive approach outlined here makes use of objective data and methods. It includes two steps: (*a*) a critical review of the planning process and (*b*) an objective evaluation of requirements for achieving program goals.

This positive approach to evaluation (*1*) has been gaining recognition in recent years. It enables the evaluator to contribute to the improvement of a health education program before its structure is fully developed and large funds are expended.

The Planning Process

One way to assure that each activity be planned in the best possible way is to review systematically and thoroughly each step in planning. Such a review may be focused in terms of several broad questions.

Identification of Needs

Are the needs which the program is trying to satisfy identified by adequate exploratory fact finding?

A program directed toward improving health practices can have little possibility of success unless it is designed with an understanding of the persons for whom it is intended and for their way of life. One should learn as much as possible about their experiences, interests, motivations, and patterns of behavior insofar as these relate to the problem at hand. What do they need? What do they want? How do they hope and plan to get it? What specific physical, sociological, or psychological characteristics do they have?

Studies of motivation have shown that individuals bring to any situation they face unique patterns of values and needs. As members of groups, individuals have common needs and experiences; they tend to develop common patterns of values. These serve them in sifting out of each new situation certain things to see and hear and to remember and act upon. People accept and use new information if it helps them to achieve their goals. They acquire new attitudes when these fit in with their past experiences and serve a useful purpose. Thus, motivations play a dynamic role in determining what people perceive as well as how they interpret what they perceive (*2–4*).

Questions such as these might be raised in reviewing a program: How does the problem tie in with those needs and values that most concern the group? In what way does the problem concern them individually? What can they personally do about the problem posed? How will members of this group use the specific in-

Dr. Knutson is chief of the experimental and evaluation services branch of the Division of Public Health Education, Public Health Service.

formation provided in the educational program?

It is not sufficient for health education to tie in with existing patterns of motivation. To be effective, it must also be attuned to habit patterns, to the way people usually live and behave. What is presented must help them to achieve health goals with a minimum of disruption in their ways of life.

It is unreasonable to expect a ready acceptance of new practices that conflict with deep-rooted habit patterns, and it is wasteful to re-educate more than is necessary to achieve adequate improvement in health practices. New attitudes and new practices are most likely to be accepted when they can be easily assimilated.

Complete objective data to answer questions such as these are seldom available to those responsible for developing health education programs. Partial information is sometimes available and local resource persons who have an understanding of the values and habits of the groups concerned may be able to provide additional information while exploratory studies are made to obtain the precise data necessary.

Agreement on Purpose

Are the program objectives agreed upon, clearly formulated, and written down?

An affirmative answer to this question is fundamental to good planning. Too often programs tend to grow without full agreement on purpose. Members of a planning group may vary considerably in their impressions of agreements that were reached. Staff members may work at cross-purposes for years without knowing they disagree on basic objectives.

In order to be meaningful, health education objectives need to be formulated within the framework of soundly developed and concretely defined program objectives. Health education serves as one of the means of achieving the goals of the total program. One might reasonably question health education activities that do not directly contribute to the broader program objectives.

Confusion and conflict are less likely to occur when objectives are fully discussed and agreed upon, and are then written down in concrete terms. There should be agreement on the precise action or improvement in health practice one hopes to achieve. Once this desired behavior is precisely defined, one can itemize the specific information and attitudes that need to be acquired in order to perform the new health practice. Such an analysis helps to identify the information that must be highlighted in the program and to omit the information that does not contribute to the attainment of the objectives.

Choosing Right Approach

Is the method or approach used the one most likely to prove successful in achieving the objectives of the program?

The choice of method used in a health education program is determined by the specific objectives of the program and the way of life of members of the community or audience. An educator who selects his methods without considering the needs, motivations, and patterns of behavior of the people of the community is in reality determining the methods of treatment before making an adequate diagnosis of the problem.

Once specific objectives have been formulated, answers to questions such as the following should be considered before attempting to determine the specific informational content of a program or the methods to be employed: How does the hoped-for improvement in behavior tie in with the pattern of experience and way of life of members of the intended audience or community? How can the action be fitted into the current behavior of the individual with the least physical, social, or psychological conflict? What problems will the individual face in trying to acquire the new practice? What personal adjustments will he have to make if the action is to become an integrated part of his daily behavior?

The final choice of method can be tested by itemizing in parallel columns all objective evidences for and against each method under consideration. Among the things to consider are: evidence of effectiveness in changing behavior, probable cost in time and money in bringing about a given improvement in behavior, and the possibilities of spreading the effect to as many members of the community as

possible. As health education objectives are defined in terms of actions to be acquired, the process of selecting the educational method to be used becomes more objective and precise. Data available from other studies in human behavior may be drawn upon in making the selection.

Accuracy of Subject Matter

Is the subject matter to be presented accurate, adequate, and impartial, and will it be accepted by those responsible for supporting and carrying out the program?

While considerable effort is usually made to assure the accuracy and completeness of the content of information or education programs, less attention is given to the equally important problem of assuring that the content will be acceptable to those in a position to support and carry out the program. Yet these individuals hold the key to success or failure.

Funds are sometimes wasted in building, packing, shipping, and setting up exhibits that are then found unacceptable to a conference exhibit committee. Posters and pamphlets have been prepared and distributed and then gone unused because the potential distributor found them unacceptable for use in his place of business. This problem is worthy of early exploration. If suggestions from the potential user or distributor are solicited and considered, costly errors of this kind may be avoided.

Both purposes may be served by drawing such individuals into planning and development. As consultants, they can contribute in many ways. While making their contribution, they will also acquire a personal stake in the success of the program.

When these or other specialists take part in this way, their reactions to content are likely to be most valuable if they are specific. General comments are difficult to interpret and even more difficult to act upon. Vague reactions can be kept to a minimum by asking the specialists to advise on each specific illustration or page under consideration. Insofar as possible, their reactions should be obtained in terms of specific criteria, such as accuracy, adequacy, impartiality, and acceptability. Asking them to indicate the specific error of omission or emphasis whenever they suggest the need for change will encourage positive criticism and eliminate misunderstanding in making revisions.

Objective Measures

In achieving any health education objective, specific intermediate conditions need to be met. These requirements or conditions may differ somewhat according to the objective to be achieved, but they generally need to be met regardless of what kind of information or educational program is planned.

1. People must be physically exposed to the information or education. They cannot be influenced unless, for example, they can see the exhibit, read the pamphlet, or hear the lecture.
2. Their attention must be attracted and held. To the degree that the information or education fails to interest them, they will not be reached psychologically even though they are physically present.
3. They must find in the information something that will satisfy their wants or help them in achieving their goals. Unless it ties in with their motivations, they have no real basis for action.
4. The action recommended should be in accord with the way people usually behave. Otherwise, action may lead to conflict in personality or adjustment, or to conflict in social behavior.
5. Words, concepts, and illustrations need to be understood. If they are not understood, people may remain uninformed or may become misinformed and confused.
6. They must really understand the point of the message. It is necessary that the primary purpose be correctly interpreted because the success or failure of the entire program may hinge upon this common agreement as to purpose.
7. They must acquire and retain the information and attitudes essential for action.

The foregoing intermediate requirements may be referred to briefly as "conditions necessary for effectiveness" to distinguish them clearly from "evidence of effectiveness," that is, evidence that behavior changes have been achieved.

Conditions necessary for effectiveness may be

likened to a series of screens through which members of the potential audience must "filter" in order to be influenced by a program (*5*, *6*). Trying out the screens with a sample of members of the audience gives a rough idea of how well the program may be expected to work when used with the total audience.

Part or all of a group may be lost through failure to satisfy any one of these conditions: For some reason, the medium or program material used may not be presented to them; if presented, it may fail to attract attention and sustain interest; if interesting, it may be too difficult for them to comprehend. As members of the audience are "screened out" through failure of the program at these specific points, the number who can be influenced is very much decreased. Once a member is lost, there is no way to win him back until the condition which led to his loss is satisfied.

If any of these conditions are not satisfied, those persons for whom the condition is not satisfied are lost to the program:

Exposure — How many persons will be reached physically?

Attention and Interest—How many persons physically reached will be reached psychologically?

Motivation—For how many reached will the program offer a means of satisfying a want or achieving a purpose?

Pattern of Behavior—For how many will the action that satisfies a want in this manner be in accord with the way people usually behave?

Comprehension—How many will understand the words, concepts, and illustrations used?

Understanding of Purpose—How many will really understand the point of the message?

Learning and Retention—How many will acquire and retain the information and attitudes essential for action?

Caution is necessary to assure that satisfaction of these conditions is not interpreted as evidence of effectiveness. Evidence that the specific goals of a program have been achieved is the only valid criterion of success (*1*).

Pretests of movies, slide films, exhibits, posters, pamphlets, and other media may be used to determine whether or not the conditions necessary for effectiveness are being satisfied. Such pretests may be made while scripts and story boards are still in rough form—before plans for production are completed. On the basis of evidence obtained at this early stage, fundamental changes may be indicated. Necessary improvements can then be made quickly at a minimum cost to the program.

The pretest should determine whether each specific condition is satisfied for the members of the audience or population. It should also identify reasons for failure if the condition is not met for some members of the audience. Reasons for failure, when identified, will usually suggest means of improvement. Barriers to success may then be removed before the program is put into operation.

Any pretesting or pre-evaluation should be made on members of groups similar to those for whom the educational program is intended. Persons of different economic, social, and educational levels vary so widely in their experiences and in their goals in life that they cannot view social situations in the same manner. Professional persons reading a pamphlet developed for a group with limited education may react in a manner completely different from the nonprofessional worker for whom it is planned. Only by testing the pamphlet on a sample of lay persons for whom it is intended can we gain some assurance that it can communicate the message it carries.

The approach outlined here is not intended as a "blueprint" for meeting all problems of pretesting or evaluation. The needs of public health vary endlessly, both in kind and extent; educational programs developed to meet these needs vary accordingly. Major changes or variations may be required in the pretest approach and the techniques employed depending upon the particular program being evaluated. A wide range of variations exists both in the broad pretest pattern and in the techniques adapted or developed to test achievement of specific program steps.

Summary

Through a critical review of the planning process and through objective pretesting, an evaluator can contribute to the improvement

of health education programs as they are being developed and before large funds are expended.

The critical review should be made before pretesting is attempted for there is little value in pretesting a program that has not been adequately planned. Such a review should consider: (*a*) Are the needs which the program is trying to satisfy identified by adequate exploratory fact-finding? (*b*) Are the program objectives agreed upon, clearly formulated, and written down? (*c*) Is the method or approach used the one most likely to prove successful in achieving the program objectives? (*d*) Is the subject matter to be presented accurate, adequate, and impartial, and will it be accepted by those responsible for supporting and conducting the program?

The pretest should be planned in terms of certain specific conditions that need to be satisfied in order to achieve program goals. With these conditions met, the program will have a much better possibility of being successful in achieving changes in behavior. Pretests determine whether or not the conditions are being satisfied and yield data useful for improving a program. Although pretesting will not guarantee the success of a program, it will greatly increase the chances of success.

Many aspects of the problem of motivating people to improve their health habits are still unknown. Exploratory research in this area is badly needed. We also need to encourage and diligently pursue post-evaluation and controlled studies of programs, both to determine program effectiveness and to identify unknown aspects of success or failure. Meanwhile, through pretesting, we can apply information now available.

ACKNOWLEDGMENT

This statement of concept was made possible by the following Institutes and Divisions of the Public Health Service which have provided the necessary financial support and practical problems for investigation: The National Cancer Institute, the National Heart Institute, the Division of Chronic Disease and Tuberculosis, and the Division of Venereal Disease. Helpful advice and assistance have been received from Dr. Mayhew Derryberry and members of the staff of the Division of Public Health Education, especially Dr. Benjamin Shimberg.

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Dr. Hunt Appointed Assistant Surgeon General

Dr. G. Halsey Hunt has been appointed an Assistant Surgeon General of the Public Health Service. He will serve as an associate chief of the Bureau of Medical Services, which is under the direction of Dr. Jack Masur.

Entering the Public Health Service as a commissioned officer in 1936, Dr. Hunt served on the surgical staffs of several of its hospitals, and in 1947 he joined the Bureau of Medical Services as assistant chief of the Division of Hospitals. He became chief of the division in 1949.

Dr. Hunt received his medical degree from Columbia University College of Physicians and Surgeons in 1928. He is a fellow of the American College of Surgeons and in 1951 was elected to the Board of Governors. He is also a member of the Surgery Study Section, National Institutes of Health, Public Health Service.

PHS publications

Hospital Beds in the United States, 1951

Under the provisions of the Hospital Survey and Construction Act, each State prepares and submits for approval to the Surgeon General of the Public Health Service a State plan for hospital and health facility construction. The first such State plan was approved in July 1947. Since that time there has been an increase of 141,958 acceptable hospital beds, 77,000 of which were acquired under the Hill-Burton program.

This review of the situation in 1951 presents figures on the number of hospital beds and estimated additional beds needed as shown by the State plans on January 1, in comparison with those for the preceding 3 years. Tables are given showing the number of existing beds and the net additional needed, by State, for general, mental, tuberculosis, and chronic disease hospitals, as well as the total for all categories. The number of existing, programed, and needed public health centers is also given.

(ED. NOTE: A report on the current situation regarding hospital bed needs appeared in *Public Health Reports*, vol. 67, pp. 312–315, March 1952.)

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Cronin, John W., and Odoroff, Maurice E.: Hospital Beds in the United States, 1951. (Public Health Service Publication No. 171) 1952. 16 pages; tables. 10 cents.

for the general public

Anemia

This nontechnical leaflet discusses what anemia is and gives a few facts about the blood, its composition, and what it does within the body. Principal causes of anemia are given, such as improper diet, faulty absorption of food, loss of blood, injury to bone marrow, infection, and parasites. Symptoms and treatment are discussed briefly, with emphasis on a complete medical examination as the best preventive measure.

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Anemia. Health Information Series, No. 55 (Public Health Service Publication No. 167). Reprinted 1952. 2-fold leaflet. 5 cents; $1.25 per 100.

Pinworms

The nature of pinworms, their activities within the body, and the signs and symptoms experienced in infection are covered in this pamphlet. It stresses the fact that these parasites can infect adults as well as children, and may be a family affair. Means of controlling the spread of pinworms outside of the body are also discussed. No treatment is specified and readers are advised to consult their physicians.

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Pinworms. Health Information Series, No. 51 (Public Health Service Publication No. 108). Reprinted 1951. 1-fold leaflet. 5 cents; $1.25 per 100.

Care of the Feet

This leaflet is concerned with the various things that can go wrong with feet and why these conditions occur. Fallen arches, corns and callouses, bunions, foot odor, swelling of the feet, varicose veins, and athlete's foot are discussed. Advice is also given on proper care of the feet—wearing comfortable, correctly fitted shoes; bathing the feet; cutting the toenails.

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Care of the Feet. Health Information Series No. 5 (Public Health Service Publication No. 109). Reprinted 1951. 1-fold leaflet. 5 cents; $1.75 per 100.

Influenza

The epidemic nature of influenza, its symptoms, and the effect of the causative agent are pointed out in this leaflet. Preventive measures, such as avoiding crowds, keeping in as good health as possible, and isolating sick members of the family are advised. The use of vaccines is discussed, with the warning that no vaccine gives protection against all strains of influenza. The treatment advised is for the patient to go to bed and call a physician.

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Influenza. Health Information Series No. 36 (Public Health Service Publication No. 163). Revised 1952. 1-fold leaflet. 5 cents; $1.25 per 100.

Asthma

A general discussion of the physiology of the bronchial tubes and the nature of asthmatic attacks is followed by a description of the different causes of bronchial asthma. The wheezy, difficult breathing in asthma may also be associated with other diseases such as heart disease and obstructions in the bronchial tubes. Therefore, early diagnosis and prompt treatment by a physician are advised. The relation of climate to asthma is also discussed.

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Asthma. Health Information Series No. 19 (Public Health Service Publication No. 155). Reprinted 1952. 6 pages. 5 cents; $2.75 per 100.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication (including its Public Health Service pubication number). Single copies of most publications can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

A REVIEW

The Public Health Service in 1952

The material presented in this review is excerpted from two recent publications of the Public Health Service. One is "The Public Health Service Today." It outlines the organizational structure of the Public Health Service and gives a broad picture of its operations. The other is the 1951 annual report, which presents in some detail the activities of the Service for the fiscal year 1951.

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The Public Health Service Today. (Public Health Service Publication No. 165) 1952. 22 pages.

Annual Report of the Public Health Service, Federal Security Agency, 1951. 79 pages. 25 cents.

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Good health for the people of the United States is a matter of vital concern. There are many agencies, voluntary organizations, and professional groups on local, State, and Federal levels all working toward the goal of longer and healthier American lives. The steady drive against diseases and environmental hazards that sicken, cripple, or kill is going forward on many fronts.

The United States Public Health Service is the principal agent of the Federal Government for protecting and improving the Nation's health. Its staff is constantly working to make more effective the multitude of efforts to conquer disease—conducting and stimulating research, aiding in the extension of health services and resources, and providing information and guidance to local and State agencies.

Job and Organization

The Public Health Service job can be summed up in three major aims:

- Conduct and support research and training in the medical and related sciences and in public health methods and administration.
- Provide a full range of medical and hospital services to persons authorized to receive care from the Service and aid in the development of the Nation's hospital and related facilities.
- Assist the States in the application of new knowledge to the prevention and control of disease, the maintenance of a healthful environment, and the development of community health services.

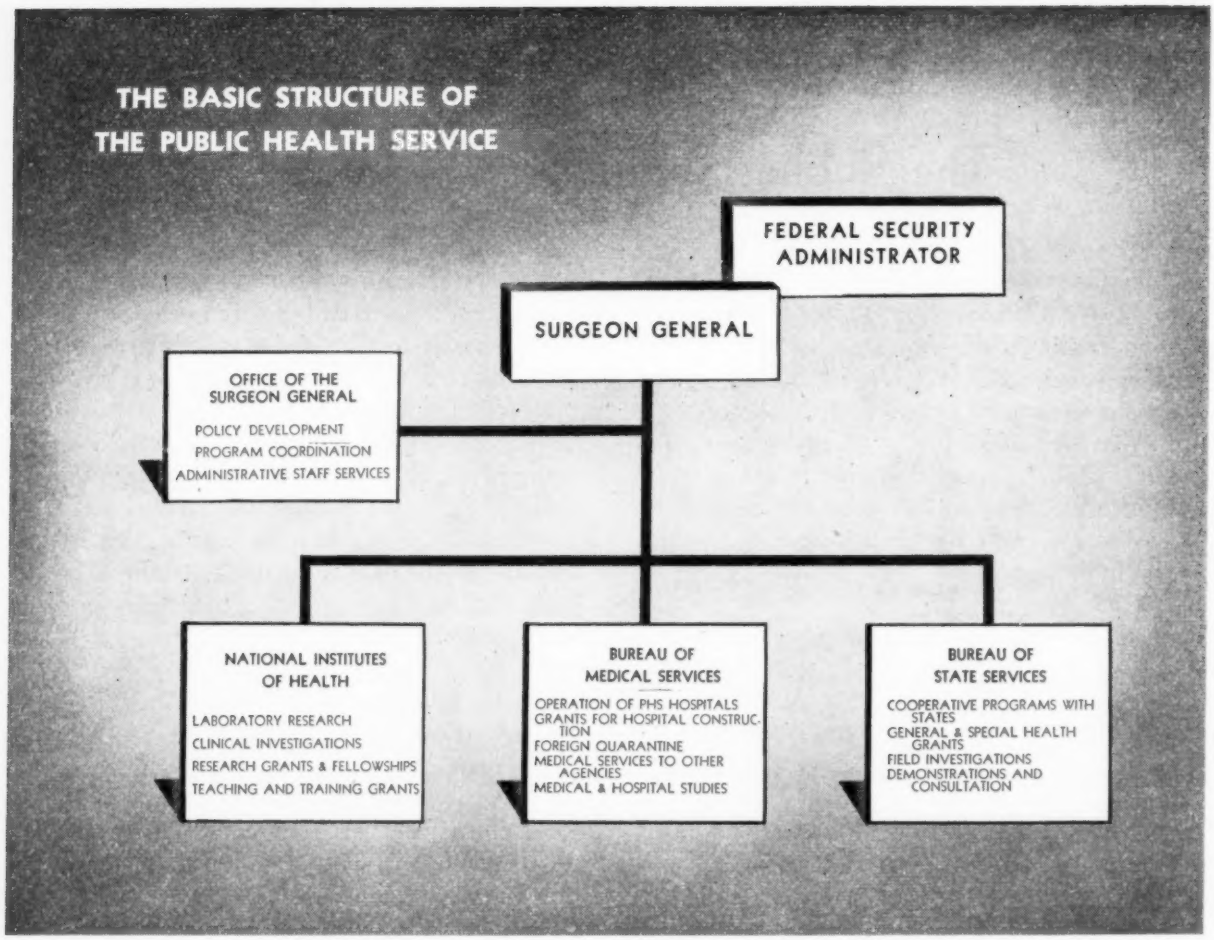
These three areas are reflected in the organization of the Service. Research is the principal responsibility of the National Institutes of Health; medical and hospital care is the responsibility of the Bureau of Medical Services; and aid to the States is the main job of the Bureau of State Services.

Administration of the Service is vested by law in the Surgeon General, aided by Assistant Surgeons General, each appointed from the Commissioned Corps. The Deputy Surgeon General is designated head of the Office of the Surgeon General—which is, in effect, a bureau of general administration.

Growth of Responsibilities

Since its beginning in 1798 as a medical care program for seamen of the American Merchant Marine, the Public Health Service has been called upon to assume many new responsibilities. Particularly in the past 15 years have advances in medical science and growing public awareness of the primary importance of health placed increased demands upon the Service.

As an example of how work of the Public Health Service has increased, the seven institutes in the National Institutes of Health have come into being since 1935, two of them since 1950. Although the Public Health Service has



been carrying on basic research for more than 50 years, the establishment of these institutes, in many instances consolidating previous activities, has resulted in a considerable expansion of the research program, particularly in the fields of chronic disease and mental illness.

The passage of the National Hospital Survey and Construction Act in 1946 increased the Public Health Service's responsibilities in the fields of medical, dental, and nursing resources and hospital facilities. In administering this act, the Service provides financial assistance and technical advice and leadership to State and local governments and to nonprofit organizations so that community needs for hospitals and health centers may be measured and plans developed to meet them.

The Public Health Service is engaged today in some 30 different programs, ranging from quarantine to chronic disease control and from the production of yellow fever vaccine to research in atomic radiation. And not the least among these is the expanding participation of the Public Health Service in the progress in world health. In cooperation with the Technical Cooperation Administration of the Department of State and the Mutual Security Agency, the Service was assisting in the operation of health programs in 8 countries during 1951 and had plans either proposed or being drafted for programs in 18 others.

Service to Other Groups

As a focal point for health activities in the Federal Government, the Public Health Service program is intimately allied with many related governmental programs in education and welfare. As part of the Federal Security Agency, it works in close cooperation with other parts of the Agency, such as the Office of Vocational Rehabilitation, the Food and Drug Administration, the Office of Education, and es-

pecially the Children's Bureau of the Social Security Administration.

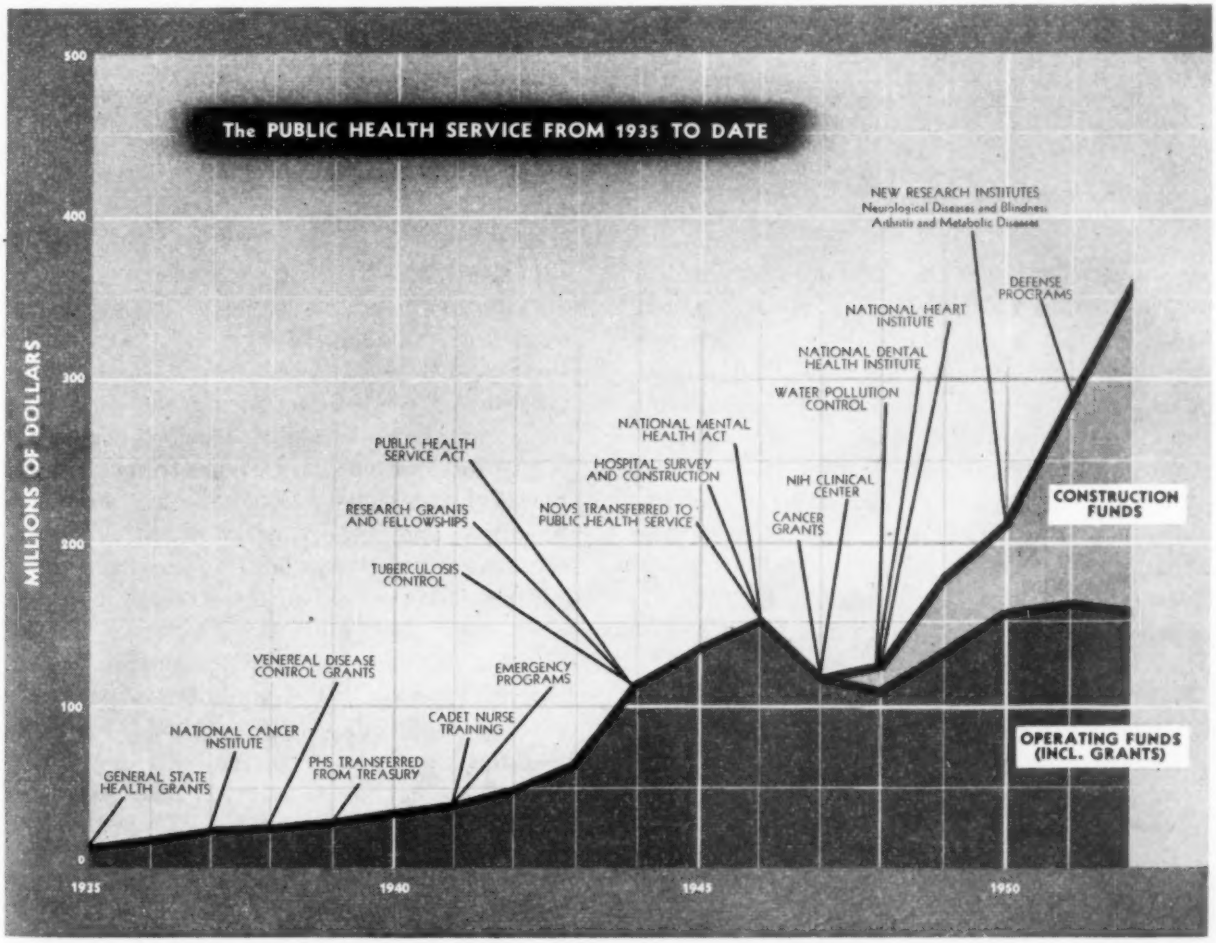
The Public Health Service also provides medical and technical services to many other agencies of the Federal Government whose general programs include medical and public health activities. For example, for the past 21 years it has supplied medical, psychiatric, dental, and nursing services to the institutions operated by the Bureau of Prisons. It assigns physicians to the United States Coast Guard to provide medical care for the crews aboard ships at sea, provides dental care, and inspects medical and dental facilities of the various sick bays and infirmaries. In addition, the Service assigns medical staff to certain bureaus within the Departments of Agriculture, Interior, Labor, and State.

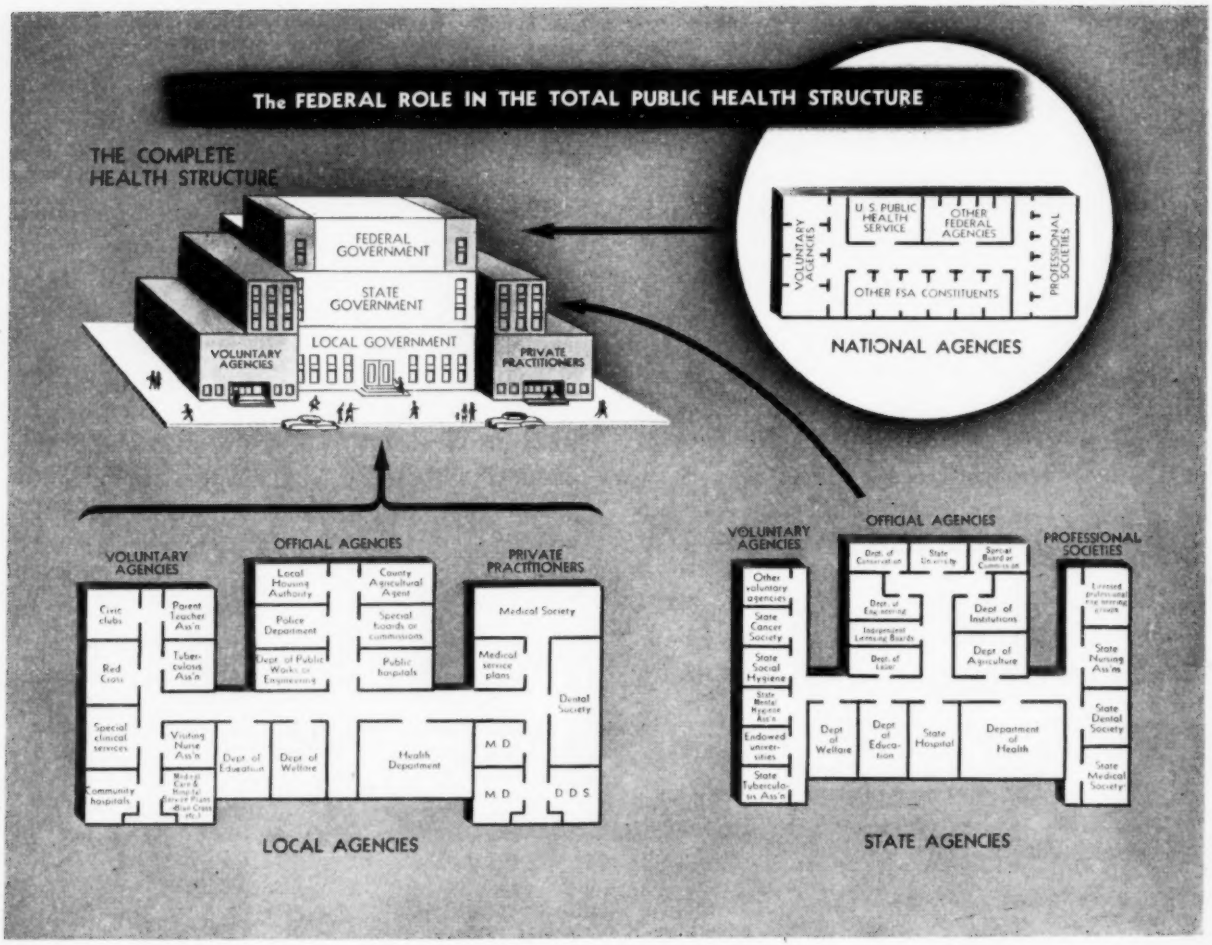
In the interests of national defense, the Service, on request, provides technical staff and consultation to the Department of Defense, the Selective Service System, the Atomic Energy Commission, the National Security Resources Board, the Office of Defense Mobilization and its constituent agencies, the National Research Council, the Federal Civil Defense Administration, and other Federal agencies.

The work of the Public Health Service, moreover, is linked closely with that of non-Federal agencies. It involves collaboration with State and local governments, medical schools, research foundations, professional associations, and voluntary agencies—in short, with the whole array of organizations concerned with the Nation's health. It is through the States, medical schools, scientific bodies, and similar groups that most of the benefits of Federal expenditures for health actually reach the public.

Personnel

To carry out its job, the Public Health Service today employs about 15,000 persons, who





are engaged in more than 250 occupations and are located in more than 600 places. About 3,000 of this total are physicians, dentists, veterinarians, sanitary engineers, and nurses. Another 500 are scientists, and the remainder constitute allied and supporting personnel.

Most of these employees work in the field, either within the United States or in such remote places as Thailand, Liberia, and the Philippines. About 2,000 of the staff are headquarters employees in Washington, and another 2,000 are in the National Institutes of Health, Bethesda, Md.

1951 Appropriations

In carrying out its assignment during the fiscal year 1951, the Public Health Service administered $332 million in appropriations and authorizations. Nearly two-thirds of this total was allocated in grants to States and to institutions and individuals outside the Federal Government. Six percent was devoted to construction of needed facilities for the Service. The remainder covered its internal operations—its hospital and medical care programs, quarantine service, demonstrations, research activities, collection and reporting of vital statistics, technical aid to States, and administration.

Far more than half of the increase in appropriations to the Public Health Service during the past 15 years has been for grants to non-Federal agencies. The number of personnel on the payroll today is 1,500 below the peak of 1944 and has declined during each of the past 4 years even though Service responsibilities have substantially increased.

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